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ABSTRACT

In an attempt to solve the problems of measuring attitude change, a dynamic testing procedure was developed that appears to be applicable to the fields of adult education, attitude theory research, and clinical counseling. This monograph, developed in a particular field of adult education (farm management), argues that, when people are able to externalize their cognitive processes, they are better able to understand how they act and incorporate new concepts into their cognitive system. It then illustrates the procedures used to design a computer-based interactive simulation game and associated computer-based psychological monitoring program to provide feedback to the participant. (PN)

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# On-line Computer Applications in Research into Attitude Change

P. W. Salmon

ERDC Report No. 31

Education Research and Development Committee

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# ON-LINE COMPUTER APPLICATIONS IN RESEARCH INTO ATTITUDE CHANGE

## Applications in Farm Management Education

PETER WILLIAM SALMON

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# DEDICATION

This monograph is dedicated to my son
Jonathan

# PREFACE

This monograph is the result of five years' research in the Agricultural Extension Research Unit, University of Melbourne. The Research Unit, initiated in 1971 by a grant from the Australian Department of Primary Industry (Australian Extension Services Grant), carries out research into the social structure of the rural industry, social problems associated with structural change, and the continued development of extension techniques to improve communication of technological research to that industry. One major area arising out of structural change has been the need to improve management skills and advice in the industry. The research reported in this monograph has since been extended by the Research Unit, and by several postgraduate students seconded from State departments of agriculture. However, the testing procedure developed has important applications outside of agriculture, and for this reason has been reported here as a technique in developing attitude change, as a basic prerequisite in adult education.

In an attempt to solve the problem of measuring attitude change, a dynamic testing procedure was developed that would seem to have considerable application potential in the fields of adult education, attitude theory research and clinical counselling. It was argued that when people are able to externalise their own cognitive processes, they are better able to understand how they act, and accordingly, incorporate new concepts into their cognitive system.

This monograph demonstrates the argument developed in a particular field of adult education, farm management education. It then illustrates the procedures used to design a computer based interactive simulation game and associated computer based psychological monitoring program to provide feedback to the participant.

Two case studies are presented which illustrate the dynamic testing procedure in practice. From these studies and other work carried out by the author, it would seem that a key feature of any educational application of computer simulation must be provision of a feedback system whereby the participant can compare his own previous experiences with those generated by the exercise. The learning process that takes place occurs when the participant has the opportunity to examine the relevance of new information to his past experience and is able to decide whether to incorporate that new information.

I would like to thank the Education Research and Development Committee for providing a grant to support this research. I would also thank the Australian Extension Services Grant Committee for their support, and the staff of the Agricultural Extension Research Unit for their involvement in the project. I would also thank all those extension officers and farmers who have so vigorously taken part in this long term research program.

# CHAPTER 1

## Theories of Attitude Change

Kiesler, Collins and Miller (1969), after a review and comparison of the various theories of attitude change, concluded that, for the most part, theorizing in this area is still at a relatively low level: assumptions are not made explicit, relations between theoretical constructs are not spelled out; and the details necessary for precise predictions are often missing. Part of the problem stems from the fact that a major portion of the experimental research on attitude change has been based on the consistency assumption, that people strive to maintain a consistent relationship among certain elements of their cognitive world. Theorists who have helped to formulate this assumption include Abelson and Rosenberg (1958), Cartwright and Harary (1956), Feather (1964), Festinger (1957, 1964), Heider (1946, 1958), Osgood and Tannenbaum (1955). Despite the experimental literature generated by these theorists, it seems quite clear that a theory based on such an assumption cannot account for all the data on attitude change.

In contrast to a consistency assumption, Kelly's (1955) Personal Construct Theory places man in a constant state of change, with each new experience modifying in some way a relatively stable self-constructed personalized world. It is useful then to look more closely at Kelly's theory, and its derivatives in cognitive psychology, in order to re-examine the problem of attitude change from another perspective.

Relating the problem of measurement of attitude change in the language of cognition, the task becomes one of measuring both conceptual structure and the process of change occurring within that structure. This poses a new problem: the availability of instrumentation to measure both structure and process in cognitive theory. The latter requirement is a necessary prerequisite to any measurement of change, yet the literature does not reveal too many attempts to measure process.

On the other hand, the literature abounds with measures of structure. A recurrent theme through cognitive psychology is that man's behaviour is a function of his cognitive structure, along with emotional and social modifiers, (Bem, 1970). The more complex his behaviour, then it is assumed that his cognitive structure is correspondingly more complex. Two frequently used measures of cognitive complexity are integration and differentiation. Lewin (1935, 1936, 1948) first raised the problem of complexity, integration and differentiation. Angyal (1941) also attempted a clear definition, as has also Harvey, Hunt and Schroeder (1961), Langley (1969), and Schroeder, Driver and Streufort (1967). However, despite a great deal of experimentation and theorizing the issue of measuring cognitive complexity still remains confused as several literature reviews have shown (of Bannister and Mair, 1968; Bieri, 1966, 1971; Bonarius, 1965; Burgoyne, 1975; Crockett, 1965; Jaspers, 1966; Langley, 1969, 1971; Schneider, 1973; Schroeder, Driver and Streufert, 1967).

The major point of confusion resides in defining complexity itself. For while there is agreement that the problem is one of determining how a person processes information about his social world and how subsequently it affects transactions with that world, complexity has been defined in terms of differentiation, the degree of differentiation of a person's psychological space, (Bieri, 1966), in terms of integration, integration of dimensions in a complex way, (Schroeder, 1967), and in terms of both integration and differentiation (Lewin, 1952).

Some of the problems generated by research into complexity, integration and differentiation stemmed from the lack of a clear theoretical and measurable understanding of cognitive structure. Simon (1970) opposed this argument and substituted an argument for simplicity which has underpinned research in artificial intelligence. He stated that a man, viewed as a behaving system, is quite simple.

The apparent complexity of his behaviour over time is largely a reflection of the complexity of the environment in which he finds himself. In taking this stance, Simon maintained that it is not necessary to postulate detailed theories of cognitive operations. It is sufficient to know only man's goals or objectives. Assuming, as the cognitive theorists, that man is an adaptive system, then to the extent that he adapts effectively as evidenced by his behaviour in attaining his objectives, one is able to make predictions of his subsequent behaviour, given only his objectives and knowledge about his environment. Simon also asserted that only a limited amount of information is needed about the internal operations of the brain. The relevant limits on internal functioning included short-term memory, amount of information able to be held in short-term memory, association, and language processing. Simon's approach is attractive, in that it avoids the confusion and terminology of cognitive theory, and instead, develops analogue models of man which act 'as if' they are processing information in the same way as man. However, it is also a subtle return to behaviourism, in that the Artificial Intelligence approach again denies any need to explore the integral properties of the 'black box' and is content to construct analogue black boxes on a computer. Unfortunately, the analogues are constrained by physical and logical properties of the computer and there is yet no evidence that man functions, even analogously, like a computer.

Faced then with two conflicting views on behaviour, one positing its complexity in internal psychological functioning, and one positing the complexity of the environment as its sole determinant, it seemed necessary to reassess the problem. As Toulmin (1971) put it:

> "While in discussions of intellectual and mental development, one can and should distinguish conceptual issues from empirical issues, they cannot be completely separated or dealt with entirely independently. On the contrary; to grasp the true nature and complexity of "cognition",

> "understanding", or "conceptual thought", one must be prepared both to reanalyse our ideas and terminology in the light of new empirical discoveries, and also to restate our empirical questions in the light of better conceptual analysis."

Accordingly, it was proposed that the question of behavioural change (attitude change, cognitive process) be reanalysed first by laying aside previous measures of structure, constructed to measure complexity, and exploring alternative measures, and, secondly, by returning to Kelly's original theory and reappraising the notion of change which permeates his theory, but is rarely measured. The following chapter explores the notion of change in Kelly's theory of Personal Constructs, and suggests the parameters required for a measure of change.

## CHAPTER 2

## A Theory of Change

Kelly (1955) stated in clear terms the basic postulate and corollaries of his Personal Construct theory. He subsequently clarified much of his original theory, but did not modify it appreciably. (Kelly 1955, 1956, 1958, 1962a, 1962b, 1963a, 1963b, 1963c, 1963d, 1964, 1965a, 1965b, 1966a, 1966b, 1966c, 1966d, 1969, 1970). Several excellent commentaries on Personal Construct Theory have been written by Bannister and Mair (1968), Bannister and Fransella (1971) and Fransella (1972). A further collection of papers edited by Bannister (1970, 1977) critically examine Kelly's contribution to psychology from theoretical, empirical and philosophical positions. In this chapter, those elements of Kelly's theory that bear on the notion of change are explored in more detail, for the notion of change permeates the whole of construct theory - 'man is a form of motion'.

Salmon (1970) has pointed to the difficulties of accommodating the notion of change in any psychological theory that is object oriented, i.e., those theories that adopt an externalised orientation toward their subject. The black box notion of behaviourism is explicitly object centered. Learning theory translates subjective concepts such as warmth, conscience, identification or dependancy, into stimulus - response sequences and patterns of reinforcement. Social learning theory likewise speaks of the socialisation process as an externalised source leading to behaviour change. But objects are static, and hence any change they undergo has to be explained in extrinsic terms. Classical learning theory accounts for personality growth in terms of physical reinforcement from the environment; social learning theory accounts for behavioural change in the child as resulting from variations in parental attitudes and practices - i.e., as social reinforcement. Construct theory on the other hand, does not have to postulate external agents as determinants of behaviour change to protect the equilibrium of the theory. For by placing the principle of change firmly within the person and by referring to the environment only in terms of the person's changing constructions of it, one avoids the dual language system of learning theory formulations.

Theories of attitude change could be criticised on the same grounds as learning theory, for they too reflect object centred language. Kiesler, Collins and Miller (1969) demonstrated in their review of research in attitude change, that most theories were couched in language with objective connotations. They concluded

> "Among the various theories of attitude change, the consistency theories are on the whole more precise and have provided us with many interesting data. Our only point is that that may not justify such an imbalance in empirical work. We enter a special plea for experimental effort on theoretical models which are not formed on the consistency assumption."

Kelly's approach to attitude change within construct theory dispensed with the consistency assumption. As Kelly (1970) saw it, behaviour was an experiment, and in behaving a man asked a question of his world. He was not propelled by any pre-existing attitude structure; he actively engaged in modifying his view on the world about him by constant experimentation. Bannister and Mair (1968) saw Kelly's fundamental postulate as avoiding three of the most persistently knotty problems of psychology. Why people do anything at all; why, over a period of time, or at any choice point, they do certain things rather than others; and, how people who are so obviously different in so many ways can yet be compared within some consistent conceptual framework. His organisation corollary further strengthened his resolve to avoid any need of the consistency assumption in construct theory.

For Kelly a construct system was relatively stable; it was not static but it evolved and took new shapes over time. Just as a person's 'personality' continuously took new shapes, so also his 'attitudes' changed as his view of himself and the world about him changed. The experience corollary also strengthened this notion of change.

Thus, the person was free to vary his construct system to incorporate new evidence as it became available to him. Bannister and Mair have illustrated the experience corollary in action when applied to a situation which traditional attitude theory would explain as an attitude change. A countryman who moved into the town continued to use his construct friendly - aloof, but in the new situation began to see some actions he would previously have called aloof as relatively friendly in the different social context. Kelly would have interpreted the change as an instance of the person recognizing aloof behaviour as an aspect of privacy, which he respected. The change occurred in terms of the person's constructions he placed on the situation. Attitude theory might well appeal to dissonance reduction to account for the change, or even social reinforcement principles to account for a behaviour change toward the urban dweller.

Kelly explicitly incorporated mechanisms of change within construct theory. Guilt, anxiety, threat and fear, were all redefined as constructs concerning change. Bannister and Mair noted that those constructs traditionally refer to emotional or affective states. But within construct theory, the construct ' emotion' was unnecessary, for it was not two psychologies, one of 'cognition' and one of 'affect', but one psychology. Therefore, the traditional trichotomy of attitudes into cognitive, affective and behavioural components has no room in construct theory. Nor is there room for a static model of man pushed or pulled into action by some inner force or external stimulus. For Kelly, man is constantly striving to make sense out of the world around him by actively setting up hypotheses and putting them to the experimental test.

Therefore, to test 'attitude change' within construct theory, one must first discard the consistency assumption, and look at ways of measuring how the person brings his construct system to bear in interpreting his world. In effect, measurement of behavioural change is measurement of the interrelationship between the constructs a person uses in a changing environment, and the process by which he alters this construct system. Measurement seeks the processes and channels along which the person moves in anticipating events in his environment.

Kelly took two different approaches to measurement of the construct system by developing the Repertory Grid Test (REP) and the Self Characterisation Test. The REP Test was designed for clinical use but since its inception it has been used in a variety of psychological experiments as mentioned previously. The REP test and the REP Grid technique that developed from it have been described by Kelly (1955), Bannister and Mair (1968), and Slater (1977). However, Kelly never really tackled the problem of measuring change itself, or the process by which people actually modify their constructs, although he enlisted his REP test results in a clinical setting to bring about change. There are few instances where subsequent construct theorists have deviated from Kelly and attempted to develop techniques to measure what must be regarded as the most fundamental characteristic of construct theory, namely, the process of change that occurs when the person attempts to experimentally validate or test his hypotheses.

Mair (1970) noted that:

> "Kelly stresses that 'man is a form of motion', but we find that movement is only awkwardly incorporated in the methods he outlined. Only by testing and retesting with the grid measures can some idea of movement be gained."

He further pointed out that:

> "The process and paths whereby a person in fact changes are still not tapped .... Kelly's functioning as a clinician does not provide an explicit framework within which personal and interpersonal changes can be systematically noted and explored."

Mair regarded construct theory as a methodological theory, which focused on how people give meaning to their lives, and the sense they make of it. Yet it still lacked adequate instrumentation to empirically test its given assumptions.

Hinkle (1965), under the guidance of Kelly, attempted to measure change with his Implications Grid (IMPGRID). By first eliciting a set of subordinate and superordinate constructs, Hinkle attempted to measure change by asking which constructs would change if the subject was forced to opt for the alternative pole of a particular construct. Implicit in Hinkle's approach was the assumption that the constructs were hierarchically ordered, and constructs further up the hierarchy, or more constructs, would be more resistant to change than sub-ordinate constructs. However, Hinkle's approach was not a measure of change but only some aspects of change thought possible by the subject. There was no environmental condition or event present to demand change.

A more powerful approach to the measurement of change in construct theory was tested by Fransella (1972). In looking at the treatment of stuttering, Fransella collected successive grids from patients over a long treatment period and used the results to explore with the patient the reconstructions needed in the process of becoming fluent. Fransella used Hinkle's approach but modified the IMPGRID to suit the clinical conditions. Whilst her results showed that change could be measured in this manner, the technique involved many months of therapy, and did not lend itself to shorter term applications where the direct process of change could be measured without interference from other ongoing life patterns. In Fransella's case, the patient, once set on a path of change from stuttering to fluency, would have been engaged in a continuous process of reconstruction between therapy sessions, and hence the grids collected would have been monitors of a process at discrete times, rather than intrinsic measures of the ongoing process.

However, Fransella's work points to the requirements of a more adequate measurement technique, already suggested by Mair. First, the application of a succession of grids to measure the successive structures of the construct system. Second, the development of a measure which would detect structural change between the grids. And third, a controlled environment for the test, such that a series of known events could be presented to the person in such a way that he would need to use his construct system repeatedly in a variety of ways to construe the events.

In essence, such a test situation would present a series of events that could be construed by the person in any way he pleased. According to the basic postulate, his constructions would depend on how he anticipated those events. Theoretically, if the events were in some way similar to previous ones in his life, Kelly's experience corollary would suggest he would vary his construct system to incorporate any new aspect from the new events. Kelly's choice corollary would ensure that he drew on previously tested behaviours, as suggested by the corresponding organization corollary. The objective of the test would be to detect precisely the modifications made to the construct system as a function of the events being presented.

The problem posed is one of developing an adequate dynamic measurement procedure to detect not only conceptual structures, but also the underlying process of structural change. In effect, the test must measure the cognitive process of adaptation to a changing environment.

The measure of structure used was the REP test (Kelly, 1955). It was used to elicit constructs from the subject, about the similarity - dissimilarity relations perceived to exist between a given set of elements. Since the resulting data matrix (derived from the REP test) may be regarded as a multidimensional data matrix, where each construct N is characterised by a vector of M elements, an appropriate multidimensional measurement technique could be applied to the data to elicit the underlying structure. However, selection of the most appropriate technique proved to be more difficult than first thought. Not because there was any lack of multidimensional data analysis computer programs; they abound. The problem with using any program is its complete blindness to the psychological meaning of the input data. Therefore the real difficulty lay in understanding the mathematical transformations applied to the data, and subsequent results. Did they conform with the required psychological transformations necessary to produce a meaningful and interpretable result?

One approach seriously explored was that of Slater (1958, 1960a, 1960b, 1964, 1965, 1968, 1970, 1972, 1973, 1977). His work in developing a set of programs to specifically analyse REP test results seemed ideally suited, for they were designed primarily to measure the psychological dimensions or structure embedded in the REP grid.

The suite of programs, known as the GAP package (Grid Analysis Package, Chetwynd, 1974) include seven programs. INGRID-72, the basic analysis program, DELTA, for analysis of differences between replicate grids, COIN, for comparison of grids aligned by constructs only, SERIES, for analysis of group grids, SEQUEL for analysis of individual differences in a group, ADELA for group grids aligned by constructs only and PREFAN for analysis of grids aligned by elements only.

Slater (1976, 1977) has thoroughly covered a wide range of application of the grid in Volume One, and Volume Two covers the mathematical analysis of the grid data and the programs developed to perform the analyses. Fransella and Bannister (1977) have also adequately covered the grid technique and compare a variety of analyses procedure currently available.

The Slater program, INGRID-72 required some modification to convert it to a dynamic testing procedure, and make it more suitable to the current application. The modifications are discussed in subsequent chapters. However, before developing the dynamic testing procedure further, it was important to delineate the practical problem area in which the concept of dynamic testing could be applied.

# CHAPTER 3

## Problem Area - Farm Management Education

Within communities there are a number of social problems calling for the attention of social researchers. The rural communities of Australia, although traditionally neglected, are no exception, and in recent years their problems have been aggravated by economic and technological changes in the rural industry. The tight relationship between rural communities and the rural industry means that any fluctuation in the industry is transmitted to the community in economic and social terms. The extent of this relationship was explored in a recent study (Salmon and Weston, 1974) of four country towns in western Victoria. A push-pull model of population movement was constructed and the factors affecting population shift were determined. The results confirmed a trend that has characterised the economic and technological restructuring of agriculture in all developed countries of the world -

> "the structure of agriculture is improving as the agricultural population diminishes through the outflow to other sectors and as the number of farms is declining. This trend is largely due to economic and social forces connected with the general process of economic growth". (Organisation for Economic and Co-operative Development, 1972.)

Victorian statistics (Salmon and Weston, 1974) indicate a definite depopulation of rural areas: the agricultural workforce fell from 13.2% in 1954 to 8.2% in 1971. In another study (Salmon, Fountain and Hawkins, 1972), the depopulation of the workforce showed up as an intergenerational effect. The father remained on the land, while the dependants left, or intended leaving. Thus, one adjustment to economic pressure has occurred by not fully replacing the present generation of farmers.

This has created a potentially serious problem in that the average age of the rural workforce is moving up. When the present generation reach retirement, there could well be a major and sudden manpower change in the structure of Australian agriculture.

In order to assess the implications of these industry changes on rural communities and service organisations, the Australian Government established a Research Unit to carry out appropriate research (Salmon and Hawkins,1973). The work of the unit included several studies(Dwyer, 1974; Hawkins, Dwyer and Almond, 1975; Hawkins and Watson, 1972; Presser, 1972; Salmon and Dwyer, 1972) of the educational implications of restructuring of agriculture, in terms of farm management training needs of the industry. For one of the major consequences of an industry moving from a labor intensive to a capital intensive operation is the increased need for managerial skill to cope with a more complex farming operation. The results consistently indicated that farmers were not enthusiastic about further education, management training or technical training despite its obvious necessity (Hawkins, Almond and Dwyer, 1974). The central problem which gave rise to the present research was the need to understand the management role of the farmer, and how it can be changed to align his skill with the demands of the new technologies.

This increasing demand for a farm management discipline seemed to be a one sided demand, arising principally from the organisations which service agriculture. Post secondary and tertiary agricultural colleges and courses have developed rapidly over the past ten years (Hawkins et al., 1974), yet they cater largely to a non-agricultural student population, while less than 10% of farmers have any post secondary management education. The growth of a professional group of farm management consultants (King, 1972) to advise farmers has been rapid in the same period, but has tapered off in recent years. Government departments of agriculture have developed special farm management advisory services (Maccallum, Burns and Potter, 1973) to conduct farmer short courses. But despite these various service growth areas, the farming community has not made any great demands on them, and attendance figures have remained low.

The literature abounds with debates on what the farmer needs, and what the farmer ought do. Research into farmer management needs have been copious but lack clear cut answers. Campbell (1968), Dean (1968), Dillon (1965), Farquhar (1966), Herriot (1965a, 1965b, 1965c), Nalson (1968), Nalson and Schapper (1966), Schapper (1968), Stewart (1968), Trotman (1965), Wallace-Jones (1950), Wark Report (1966), Williams (1968), Woodgate (1947) are among prominent Australian writers advocating the development of farm management courses, principally in economics, for farmers. However, very little research was available on the effectiveness of courses established, and what research was available pointed to poor results (Black, 1972, 1973; Campbell, 1968; Hawkins et al., 1974; Herriot, 1965). American studies abound in the literature, but they too, were disappointing in their findings. Persons, Swanson, Kittleson, and Leske (1968) conducted an 8 year longitudinal research program with 3,000 farmers, with weekly farm management training programs. Initially, the results measured in economic terms were excellent. However, during the fourth to fifth years the economic gain lost ground and farmers' income fell below the initial level. It was only after the seventh to eighth years that farms began a steady increase in income. Persons accounted for the phenomenon as follows:

> "The decline in return during the fourth and fifth years is more a function of the instructional program than a 'diminishing return' effect. Since the business often undergoes major changes, instruction in business reorganisation procedures is essential to increased return".

Therefore, he concluded, short courses as traditionally structured cannot hope to bring about the long term change that is necessary in management if these changes are to be permanent.

> "Those who advocate restriction of farm business management education to three or less years will fail to accommodate the increased need for decision-making that occurs as part of business reorganisation. Failure to provide educational service at this most vital time may deter the farm family from fully utilizing the income production potential that may be derived from careful study and assistance during planning and initiation of resource reorganisation."

It would seem then, that despite the enthusiasm of economists and agricultural education establishments, the farming community saw little relevance or need for education or training in management in the present context of Australian agriculture, and, even where it may have appeared relevant, it was conducted over too short a time span to be effective.

The second facet research often encountered in the literature on farm management behaviour was the area of managerial attitudes. Extension personnel and rural sociologists have long put forward the theory that the rural community was a specific subculture, with its own social norms which by and large exclude such values as education and training (Dwyer, 1974; Hawkins et al., 1974; Presser, 1972). The most widely researched area was that of adoption practices, initiated by Rogers, (1961, 1962), Rogers and Beal, (1958a, 1958b) and Rogers and Shoemaker (1971). But again the model was unidimensional and failed to predict overall management behaviour (Richards, 1973).

## Table 1

### Human Factors Covered by 73 U.S. and European Studies - Muggen 1969

**Ability Variables**

intelligence, mental abilities, abstract reasoning, power of abstraction, mechanical reasoning, space relations, imaginative faculty, numerical ability, numerical reasoning, mechanical comprehension, vocabulary, verbal reasoning, independent critical thinking, ability to combine ideas, memory, calculation, analytical ability, originality and imagination, action taking, workmanship, thoroughness in work, economic knowledge, accounting knowledge, management knowledge, agricultural knowledge.

**Biographical Variables**

general education, vocational education, age, farming experience, off-farm experience, socio-economic status, job mobility, geographic mobility, personal experience.

**Motivation Variables**

motivation, industriousness, scientific orientation, mental activity, independence, risk aversion, attitude to credit, interest in farming, interest in new developments, goals, attitudes, values.

**Management Process Variables**

use of information services, use of scientific method of decision making, decision making ability, planning and organisation practices, plans for future, keeping records, adoption practices.

Closely allied to social behaviour was the research looking for a unique set of personality characteristics which differentiate the farmer from the general population. Muggen (1969) reviewed seventy-three studies carried out in Europe and America which looked at human factors in farm management. Table 1 shows the types of factors covered by the studies.

Despite the breadth of coverage by these studies, no significant picture emerged of the farmer as different from the general population. Age yielded conflicting results (Muggen, 1969); motivation likewise yielded disappointing results; the only factor which was found to be significant in more than one study was scientific orientation among farmers. Muggen concluded that despite the number of human factor studies carried out in recent years the magnitude of the correlations obtained in these studies showed that understanding of these factors was strictly limited.

Van Dan Ban (1970) reviewed some twenty-five Dutch studies of human factors in farm management, and concluded that while it was generally believed that the personal qualities of a farmer make a lot of difference in his farm income, it was not known which qualities correlated with a high income in the Netherlands.

Richards (1973) in an even more exhaustive review of one hundred and eleven research studies, carried out over twenty-five years in America by behavioural scientists, grouped their results into three categories:

(a) Predictors of choice, success, satisfaction
(b) Adoption of recommended practices
(c) Commercial agriculture

Yet Richards was unable to find any consistent relationship between these results and productivity. In another study Richards (1972) looked at characteristics of young farmers in the Talant Project and found that the characteristics tapped by psychological tests appeared to have few strong relationships to choice, satisfaction, and success in farming as a career. In a third study Richards (1973) looked at adoption of farm practices as a general trait, following on the work of Copp (1956) and Fliegel (1956). Again he noted that the results cast strong doubts on the usefulness of treating farm practice adoption as a general trait.

Finally, Krause and Williams (1968) carried out a detailed longitudinal study during 1960-1964. The items included financial details (assets, debts, net worth, credit, ownership, etc.) agricultural details (crop yield, livestock, etc.), motivation and personality factors (constructed from items from the MMPI), three vocational interest and ability measures (including Edward's Strong Vocational Interest Blank) and an assortment of biographical detail. Whilst their results showed a positive relationship between change in net worth (criterion variable indicating managerial skill) and some personality factors, they were cautious in drawing conclusions from the results.

In the light of all previous studies it would seem that Krause and Williams' caution was justified. For despite the large number of behavioural studies conducted throughout the world in agriculture, no clear picture emerged that pointed to a strong relationship between managerial success and social or personality variables.

However, the fact remains that there was an increasing need to find ways to improve the manipulation of technology, innovation, and factors of production to increase man's food supply and living standards. To meet this need an improved ability to understand, to teach, and to apply management effectiveness must be developed and learned by an increasing number of farmers, to offset the decrease in labor which is occurring as agriculture becomes a capital intensive industry. Agricultural management research to date has failed to provide clear cut social indicators of good farm management. Economic definitions of farm management skill are well documented (Dillon 1965), but concentrate on the decision making or analytical side of farm management. The psychological correlates of farm management still remain a clouded issued and a new approach was needed from a different theoretical base.

# CHAPTER 4

## A Theory of Farm Management

Jones (1970) in an analysis of design methodology provided an insight into the evolution of the craftsman. It was not too difficult to see the parallel development that has occurred in farming. It was useful therefore to dwell on Jones' thesis as his conclusions have a central bearing on the alternative model of farming suggested in this current monograph.

Jones defined designing as the initiation of change in man-made things, and went on to point out that the earliest initiator of change in man-made things was not the maker-of-drawings but the maker-of-things, the skilled craftsman, the 'designer' who takes over where natural evolution leaves off. Thus the craft process can produce a beautiful and complicated object that could be mistaken for the work of a highly skilled designer. The beautifully organised complexity of a farm wagon, the rowing boat, the violin and the axe have been achieved without the help of trained designers, managers, salesmen and many other specialists upon which modern industry depends.

> "It is equally surprising that an illiterate craftsman, with only his simple tools to help him, appears to govern an evolutionary process without any equivalent of genetic coding from which to derive the complex forms that he reproduces. However, .... there is hidden in the apparent simplicity of primitive craftwork, a subtle and reliable information - transmission system that is probably more efficient than design-by-drawing..."
>
> (Jones 1970)

Jones supported his thesis by quoting extensively from George Sturt's (1923) book The Wheelwright's Shop in which a rare description of craft evolution was given by one of the few people who were both literate and craftsmen. A few illustrations from Sturt will complete the line of argument developed:

> "... we got curiously intimate with the peculiar needs of the neighbourhood. In farm-wagon or dung-cart, barley-roller, plough, water barrel, or what not, the dimensions we chose, the curves we followed (and almost every piece of timber was curved) were imposed upon us by the nature of the soil in this or that farm, the gradient of this or that hill, the temper of this or that customer or his choice perhaps in horse flesh ...".

Sturt goes on to illustrate the peculiar problems inherent in understanding why the wagon wheel was a dish shape and not flat. He concludes:

> "Necessity in fact fixed for wagon the lines between too high and too low; and in generations of experience farm men found these invisible lines and wheelwrights learnt how to get every farm-wagon trundling along on them.
> "Necessity gave the law at every detail, and in scores of ways insisted on conformity.
> "...The nature of this knowledge should be noted. It was set out in no book. It was not scientific. I never met a man who professed any other than empirical acquaintance with the wagon-builder's lore .... This sort of thing I knew, and in vast detail in course of time: but I seldom knew why ... But for the most part the details were but dimly understood; the whole body of knowledge was a mystery, residing in the folk collectively, but never wholly in any individual".

The parallel drawn between craftsman and farmer resided in two of Sturt's statements - necessity imposed direction of development, and that a body of knowledge existed collectively. Farming is an occupation probably as old as man himself. Therefore it would seem logical to assume that a vast body of knowledge has been distilled over many centuries, and faithfully transmitted from one generation to the next, on the art of farming. The majority of farmers still adhere to the belief that farming can only be learnt by practical experience and contact with other farmers. In other words, they still continue to tap the distilled body of knowledge resident in their midst, without really being aware of it, rather than undertake formal training.

Jones summarises four features of craft evolution:

1. Craftsmen often cannot give adequate reasons for the decisions they take.
2. The form of a craft product is modified by countless failures and successes in a process of trial and error over many centuries. The result is usually a well balanced one providing a close fit to the needs of the user.
3. Craft evolution can produce discordant features. This suggests that the process of evolution has not yet assimilated the sudden changes in demand of the product.
4. The cumulative store of the essential information generated by craft evolution is firstly in the form of the product itself.

If one accepts that Jones' analysis of craft evolution can be equally well applied to farmers, then the art of farming, henceforth referred to as farm management, would conform to these four features; i.e.,

1. Farmers often cannot give adequate reasons for the decisions they take.
2. The form of farm management is modified by countless failures and successes in a process of trial and error over many centuries.
3. Farm management can produce discordant features.
4. The cumulative store of essential information generated by the evolution of farm management is firstly in the form of the product itself - the well established farm.

There was empirical evidence available to support these points. The work of the Agricultural Extension Research Unit, University of Melbourne, over the past eightyears has shown some consistent trends amongst farmers to reject advice from specialists, such as the departments of agriculture, farm management consultants, university staff and commercial firms (Hawkins, Almond and Dwyer, 1974). Their basic philosophy was that the only way to learn farming was by practical experience, and working with or talking to other successful farmers.

This feeling was confirmed in the findings of an earlier national survey of 80,000 farmers (Salmon, Fountain and Hawkins, 1973) in which only 25% of the respondents expressed interest in any form of farm management training. Stratification of the sample into enterprise size showed that interest in management was expressed largely by the bigger enterprises in sheep and beef. Small acreage farmers showed significantly lower interest. As expected, those interested were the younger group; 85.5% of those interested were under forty years of age. Given that the average age of the rural workforce is 43.3 years (Salmon and Weston, 1974), the findings indicated that interest in management was probably confined to the younger generation of farmers, which forms a minority group in a skewed workforce distribution. The skew was due to a large proportion of farmers over 65 years old still in the workforce. It was likely that interest in management training would increase quite dramatically when the present majority of farmers reaches retirement, and the minority moves into a majority position. Table 6 showed the rapid rate of rural workforce decline in Victoria since 1954.

Thus, the total Australian Workforce was a younger group (average age in 1971 was 28.8 years old), and as detailed in the Borrie Report (1975), the Australian workforce will continue for at least the next twenty years to remain a relatively young workforce, but better educated than in the past. Given these two factors, plus the survey data, it would seem reasonable to predict an increase in demand for farm management training from a younger, better educated generation of farmers. On the other hand, the current attitude of older farmers toward education in general and farm management training in particular, brings into sharp focus the conflict within the rural industry at present, on the question of farm management training and its relevance to good farming. The older farmers insist on practical experience as the best teacher, while the younger farmers see a vital role for management training in order to cope with the highly mechanised, large multi-enterprise type farming of the future. The conflict probably goes a lot deeper, reflecting the same conflict that occurred in secondary industry during the industrial revolution. That is, the skilled craftsman who learnt his skills by practical experience from another craftsman (apprenticeship learning) has been largely displaced by mass production of technologists skilled in parts of the total production system. The assembler on the mass

## Table 2

### Rural workforce as a percent of total workforce in Victoria 1954 - 1971*

| 1954 | 1961 | 1966 | 1971 |
|---|---|---|---|
| 13.2 | 10.8 | 9.3 | 8.2 |

* From Salmon & Weston, 1974

production line in the automobile industry is an extreme example. Thus it is suggested that the present agrarian revolution in enterprise structure and management will in time both demand and produce a very different type of farmer in the future.

The central issue then, was how can the accumulated knowledge of thousands of years of farming experience be culled from the existing generation of farmers, to ensure that its more important elements are understood and incorporated into the farm management training programs of the future. Given the hostility of present farmers to farm management training which they see as largely training in economics, the task remains for the educator to salvage existing knowledge and integrate it with modern technology and financial knowledge which will be so necessary for farm management of the future.

In the following chapter, a technique was suggested, based on cognitive psychology, to tap the pool of knowledge handed on from farmer to farmer, who, when questioned individually cannot give cogent reasons for their management practices, but when taken collectively produce the efficient form of farming as it exists today.

## CHAPTER 5

## The Farmer as Scientist

Kelly (1955) would almost certainly agree with the farmer that the best way to learn farming was by practical experience. In effect his model of 'man-the-scientist' fits perfectly well as 'farmer-the-scientist'. It was in this context that the farmer was analysed and some propositions put forward about adult or continuing education.

Kelly's Personal Construct Theory has been reviewed by Bannister and Fransella (1971), Bannister and Mair (1968), and an example of its flexibility and usefulness in treating stuttering was given in Fransella (1972). A model of the 'farmer-as-scientist' was developed, and one particular characteristic of Kelly's theory given particular attention - the notion of change.

Applying Kelly's fundamental postulate to the farmer puts the theory into perspective.

> "A person's processes are psychologically channellized by the ways in which he anticipates events."

This fundamental postulate attempted to state what man is in business for. Kelly stresses that man is in business to make sense out of his world and to test the sense he has made in terms of its productive capacity. In terms of the farmer, his world was very much an agrarian one. Therefore his actions were those of a man checking how much sense he has made of the world, the act of anticipation. To give some stability to these acts, Kelly adds the construction corollary -

> "A person anticipates events by construing their replications".

Thus in making sense out of the world and his life the farmer can be seen as continually engaged in the detection of repeated themes in events, and subsequent categorisation of them into comprehensible segments. The organisation corollary ensured the establishment of a total construct system, which guided the farmer in his daily act of living:

> "each person characteristically evolves, for his convenience in anticipating events, a construct system embracing ordinal relationship between constructs".

The corollaries, however, needed to understand the behaviour of the farmer, and indeed to support Stuart's insight into the evolution of the craftsman, were the choice corollary, the experience corollary, and the commonality corollary.

The choice corollary ensured that in the process of developing a personal construct system the farmer moved in those directions which seemed to him to make most sense. The experience corollary strengthened this development, and was central to an understanding of the continuing education process. The personal construct system contained all a farmer has learned, and was a statement of his intentions and values. As such it was a theory continually being tested and modified. As Bannister and Mair pointed out -

> "Kelly argues that experience refers to the constructions and revision of constructions placed upon events, rather than to the repeated confrontation with events which are always viewed in exactly the same way".

Bannister and Mair then developed an argument which is central to the present thesis, and warrants being set out in full:

> "Kelly assumed that learning takes place all the time and is so general that it need not be elevated into an area of study in its own right. In arguing that a person's construction system varies as he successively construes the replication of events, and assuming that all psychological processes are channelled by one's construction of events, he sought to build the notion of learning into the assumptive structure of his theory, rather than deal with it as a particular category of events. Thus he suggests that the questions of whether or not learning takes place, what is learned and what is not, need no longer be important debating topics *within his system*.
>
> "The burden of our assumption is that learning is not a special class of psychological processes; it is synonymous with any and all psychological processes. It is not something that happens to a person on occasion; it is what makes him a person in the first place."
>
> (Bannister and Mair, 1971)

For Kelly then, the process of construing is a process of learning. And as the farmer continued to erect his own construct theory which best predicts events for him, and modify it by experience, he was engaged in a life-long learning process. The commonality corollary completed the picture and explained how the farmer delved into the accumulated wisdom of experience. It stated that farmers were similar because they construe, discriminate, interpret events in similar ways. That is, certain events can have the same meaning for groups of people. It is not necessary that they have experienced 'the same' events; what has to be similar is their construction of experience. Bannister and Mair summarised the corollary very neatly. The point here is that, having encountered different sets of circumstances, and worked out their ideas about what these circumstances were all about, they have come to similar conclusions.

It was relatively easy to see that if the circumstances were similar, i.e. farming conditions, and the farmer was guided in his construction of management principles by other farmers who share a similar construct system, then the process of 'learning' farming would occur best in interaction with both the farming environment and other peers. Learning here was taken as synonymous with the process of building up a farm management system of constructs.

> "We have taken the basic view that whatever is characteristic of thought is descriptive of the thinker; ... If we examine a person's philosophy closely, we find ourselves staring at the person himself. If we reach an understanding of how a person behaves, we discover it in the manner in which he represents his circumstances to himself."
> (Kelly, 1955)

If Kelly's assertion is true, and if the farmer is viewed as 'farmer-the-scientist', then one should be able to examine the farm management construction system of a farmer by examining his thought processes, his basic management philosophy, and the way he represents management to himself. And if an evolutionary process has occurred, transmitting essential management knowledge and skills from one generation to the next, then this distilled body of knowledge should become apparent in an analysis of farmers' management behaviour.

By definition constructs are those patterns tentatively 'tried on for size', a representation of the universe erected by man. Since he seeks to improve his constructs by increasing his repertory, by altering them to provide better fits, the farmer really does learn from practical experience as he builds up his personal construct system on farming. As Kelly saw it man creates his own ways of seeing the world in which he lives; the world does not create them for him. He builds constructs and 'tries them on for size'.

Looked at from the perspective of personal construct theory most of the literature on research into farm management behaviour was bound to fail, because demographic, attitudinal, personality and economic indices were based on incomplete theories of total human behaviour. A construct theory approach to management makes the researcher concentrate on the individual to find out how he ordered his world, rather than on how he behaved in relation to it. This position was fundamentally poles apart from Simon's (1969) cybernetic view of man, in which external behaviour only was the criterion measure and predictor of man's actions. Kelly's views on the other hand focus on how a farmer construes an act, person, place or thing. As Fransella (1972) pointed out -

> "No situation is intrinsically dangerous, anxiety-provoking or beautiful, it is only so if we construe in that way. No particular word or situation is more 'difficult' than any other unless it is construed."

Therefore, from the standpoint of farm management, the study of management could be carried out within the same theoretical framework as the study of the person who was managing. One can usefully paraphrase Fransella's model of stuttering and apply it to farm management. An investigation of the relationship between variability in management behaviour and construing should make it possible to explain one of the overwhelmingly consistent facts about management - that the variability among a group of farmers may be greater than that between groups of farmers and non-farmers. Another effect of using a construct theory explanation of management was that it did not lead just to one form of management but suggested that changes in construing underlie all responses to management education, no matter what form that education takes, be it a short course, a full post-secondary education course, or just knowledge elicited from other farmers. The person who responds to any of these educational situations was seen as being one who has been able to take advantage of the situation in which he finds himself and to reconstrue himself in relation to his management behaviour. If he can build up a system of constructs and implications to make management more meaningful, so he will be more likely to gain and maintain that system of management behaviour. Such conceptual changes should be regarded as the common denominator running through all forms of management education in which the farmer shows improvement. Looked at from the point of view of continuous learning, emphasis is on reconstruction and increased meaningfulness of management to the individual farmer. As he became more proficient he could experiment more fully with his management construct system. And it was during this experimental stage that he needed guidance, for some experiments would be failures, and he would need help in construing the invalidating evidence. Unfortunately, as in so many adult learning situations, the teacher failed to recognise that what the student learns is not what the teacher gives (his own constructions) but only those elements of the teacher's construct system that fit into the student's system. Therefore as a Kellian educator, one can only strive to create an environment which is conducive to, and encourages personal experimentation by the student. For learning means construing, and if a course fails to attract participants it is most likely that the course is not seen to offer anything that is relevant to a person's present construct system; it fails to challenge that system. Or as personal construct theory would state it, the course is outside the range of convenience of the participant. Of course it may also be the case that such people have a tight construct system which is impermeable to change. In the limiting case, a person would have an invariant structure, and refuse to entertain the idea that it may be changed. As Salmon (1970) put it -

> "Having forged out of his experience in the long journey through childhood and adolescence, a construing system which seems to cover most of the interpersonal situations he has met so far, he may then settle for this as the best model he can hope to achieve, and may as a result,

> cease, in Kelly's terms to 'experiment
> with his life'."

This would also be true of the farmer who believed his model of management was the best model he can hope to achieve and refused (is impermeable) to experiment further.

This type of farmer would not turn up at a course anyway. On the other hand, those that do turn up, despite their external protestations, were very likely still in the process of experimentation and would make use of the course if it offered useful reconstructions to his developing system. Therefore it was suggested that the present poor response to proliferating farm management courses was due partly to them being perceived by farmers as outside the range of convenience of their present management systems. This was not a condemnation of the courses offered. Rather it was an indicator that present farmer management behaviour does not incorporate those elements (usually financial and economics) into its collective thinking as the situation demands. As a result, there was an hiatus between present farm management behaviour and the management behaviour needed to cope with the radical economic, marketing and technological restructuring presently occurring in the Australian rural industry. And although it could be expected that the natural evolutionary process would eventually develop newer, more adaptive forms of management, the rate at which change was presently occurring was too great for natural evolution alone to adapt; hence the need for relevant management education courses which fall within the range of convenience of present farmer management systems and stimulate reconstruction of a more adaptive system.

To summarise, the theoretical position advanced here was that farmers do manage their farms because they know how to do it. It was not a maladaptive form of management. On the contrary, he is a success, not a failure, and already has management skills. On the other hand, present industry structure demands a different type of management. It was suggested that the educational road from current management practice to required management practice is paved by reconstructions.

# CHAPTER 6

## The Process of Change in Farm Management Behaviour

Personal construct theory was the implementation of a philosophical assumption which Kelly called constructive alternativism..

> "The events we face today are subject to as
> great a variety of constructions as our wits
> will enable us to contrive .... the obvious
> occurrences of everyday life might appear
> utterly transformed if we are inventive
> enough to construe them differently."
> (Kelly 1970)

If one looks at attitude formation in the light of construct theory as the act of construing it would seem logical to assert that attitude change was synonomous with the process of reconstruction. Constructs are imposed on events, not abstracted from them. Kelly allows the person freedom to impose different constructs on the same event, if he has reconstructed his system. In effect, the person whose negative attitudes about blacks were changed after several pleasant encounters with black people, has, in personal construct theory terms, modified or reconstrued his construct system about blacks. Adams-Webber (1970) best described this process:

> "As events subject a person's anticipation to a
> validational process, confirming some of them
> and disconfirming others, his constructs
> undergo progressive changes as a function of
> the fact that he successively revises them in
> the light of this 'feedback'."

It was this process of change, the revision of old constructs, the incorporation of new constructs, that was still largely unexplored in construct theory. As an earlier review of the literature showed, many theorists have tried to imply process from structural measures, i.e.

differentiation in terms of grid structure etc. The result to date was general confusion about what was actually being measured. As Mair (1970) put it -

> "The processes and paths whereby a person in fact changes are still not tapped. In Fixed Role Therapy as in any therapy, changes are of course central, but Kelly functioning as a therapist does not provide an explicit framework within which personal and interpersonal changes can be systematically noted and explored."

Personal Construct Theory was really a methodological theory in that it focused on how people gave meaning to their lives, rather than attempting to measure the process of internal change taking place within their construct system. Yet as Salmon (1970) pointed out, Kelly clearly defined the change process as the act of anticipation. On the other hand, Mair (1970) stated that although Kelly insisted that 'man is a form of motion', as mentioned previously;

> "we find that movement is only awkwardly incorporated in the methods he outlined. Only by testing and retesting with grid measure can some idea of movement be gained."

And it was this test-retest procedure that Fransella (1972) used to look at change occurring with stutterers. Perhaps one can excuse Kelly for avoiding the problem of measuring change on the grounds that the means necessary to develop a measure were not available to him at that time. For example, his original outline of a method of analysis of the grid was quite primitive in the light of modern computer techniques and multidimensional data analysis programs. Slater's program INGRID 72 was an excellent grid analysis facility which was not possible to construct in Kelly's time. However, the technology was now available and awaits application to solve the measurement problem.

The clearest description of the construct was given by Kelly (1970) in the following terms -

> "They are reference axes, upon which one may project events in an effort to make some sense

out of what is going on. In this sense they are like Cartesian coordinates, the x, y and z axes of analytic geometry. Events correspond to points in the Cartesian space .... The Cartesian axes do not represent the points projected upon them but serve as guidelines for locating those points. That also is what constructs do for events, including ones that have not yet occurred. They help us to locate them, understand them, and anticipate them."

Slater's approach to deriving the Cartesian coordinates from the grid was to prepare the data and apply a principal components analysis, yielding the component structure and component loadings. These loadings were then plotted by hand to yield the location of both constructs (rows) and elements (columns) in the grid. Use of a second program, DELTA, was then made to measure differences between grids. In the event of trying to measure change, DELTA would yield a difference measure between two grids given at different times to the same subject.

Returning to the problem of farm management, and the task of eliciting the knowledge of farming gleaned from experience by farmers, the construct theory approach via the grid would provide a suitable test mechanism. However, in terms of construct theory, a management construct system would only be used by the farmer in a farming situation. That is if he were asked what he regarded as the important constructs that he used in managing his farm, he would be unable to elecit them fully since many would be unconscious behaviour responses to environmental events. To this extent Simon was correct in suggesting that the farmer's behaviour could be predicted on the basis of his environment. However, construct theory does not predict behaviour, but rather it explores the reasons why the person behaves, given the environmental conditions. The task then, of eliciting the correct management constructs would depend on provision of a suitable environment. In the case of farming the ideal environment would be a farm.

The process of decision making in farming was closely related to time and climate. For example, a wheat farmer may decide to sow a crop in April, but lack of rain may force him to postpone sowing. Similarly, when a decision to mate a flock of sheep was made, the farmer has to wait months before receiving any feedback about the wisdom of his decision Therefore, use of the farm as an environment to elicit constructs about farm management was inappropriate, because not all management constructs would be used at any one time. The relevant constructs were only used when the appropriate environmental and time conditions occur.

As an alternative, computer simulation offers a way around the impasse. If a simulation model of a farm was used with sufficient complexity in decision making and output behaviour, then it would serve as a controlled environment in which management constructs could be elicited from the farmer. The role of simulation in farm management was covered by Anderson (1972), Babb and Eisgruber (1966) and Dent and Anderson (1971). Longworth (1969, 1970) reviewed the literature on farm management simulation. Longworth (1969) developed a complex farm management model as a Ph.D. thesis, and it was this game that was selected for use in the present study. The next chapter looks more closely at the technical aspects of the game.

Theoretically, a farmer playing a farm management game (not necessarily a computer game) would in a Kellian sense bring his personal construct system to bear on his management decisions in the game, provided no formal rules or restrictions were placed on him, constraining the use of his own constructs. If this was the case, then the farmer was more likely to bring into operation many of the management strategies he ordinarily used in real life farming. Therefore, if his management philosophy and decisions were recorded during the process of the game, some insight into his management construct system should result.

A second vital factor in this process was the concept of positive feedback. A computer simulated farm was an ideal tool for creating positive feedback on earlier decisions, as it compressed time to a minimum. In the case of the Longworth's (1969) Central Tablelands Farm Management Game it was possible to get simulated 'monthly' progress reports on any or all aspects of the farm. As will be seen in the next chapter, some major changes were made to the game by the author in order to make the positive feedback of management results much faster and more useful.

However, it was not sufficient to gather management behaviour from the farm game as evidence of management constructs. A more formal approach was necessary. Kelly's Repertory grid still offered a useful technique for eliciting constructs. If various aspects of management were used as elements, the elicited constructs should provide some insight into the management construct system. Applying the concept of positive feedback to the grid results, by showing them to the manager, should lead to further insights into his management construct system. As Fransella (1972) has shown, the positive feedback of grid results to stutterers lead to a significant improvement in fluency of speech. However, Fransella fed back her results over a long period of time through weekly therapeutic sessions. In one instance therapy occupied a period of four years. In the present situation, therapy was not an objective. Rather, the aim was to set up a measurement technique which gave an accurate picture of a farm management construct system. Positive feedback, therefore, would give the manager an insight into his own management system, and facilitate subsequent exploration of this system in repeated applications of the grid.

The central objective of this study therefore was to develop measurement techniques to examine the dimensions of farmer's farm management construct systems, in order to determine the components of change which underlie his management behaviour. To create a realistic management environment use was made of a computer simulation model of a mixed enterprise farm. To measure his construct system the REP grid was used several times during the period of playing the management game. The elements in the grids were selected by the farmer as representative of his own management style. The management game therefore creates a dynamic management decision making environment, complete with constant feedback about the state of the farm. Within this environment the farmer was able to explore his management behaviour using positive feedback from a succession of REP grids. This testing process is referred to as a *dynamic testing procedure*.

# CHAPTER 7

## The Farm Management Game

Longworth's (1969) Central Tablelands Farm Management Game (CTFMG) was a complex computer simulation program designed to meet three objectives -

(a) a dynamic illustration of farm management principles and procedures;

(b) a means of demonstrating the integration of the principles of plant and animal husbandry into an economic unit;

(c) a focus for discussion of institutional facets of management such as farm accounting, taxation and credit.

Designed principally as a teaching tool for university level agricultural economics students, the game provided for a large range of decisions to be made 'monthly' by the participants. As an economics teaching tool, the 'monthly' output was quite detailed and was meant to provide economic data to facilitate budgeting and cash flow decisions. Like many computer simulation games it was designed to provide interactive feedback between output and participant. Used in this way, the game acted as a model of a farm with the educational intent of modifying economic management thinking of the participant. Longworth pointed out that at least three weeks, at two hours per week, should be put aside to instruct students on economic management before actually using the game.

However, there was no reason why the game could not be used in a different way. From a psychological stand point, interest in management behaviour was more readily focused on the interaction between participant and input to the game. It was at this point that the participant can give reasons why he used and modified his strategies after feedback from the output. And if the rigid economic constraints were removed, which require a detailed budgeting and cash flow analyses be carried out before entering new decisions, then the interaction at input became more interesting.

Freed from any constraints the participant would be forced to fall back on his own management construct system and play the game based on experience. In the case of the farmer, he will readily be able to act on experience.

Longworth (1970) provided a good summary of the game. The computerized simulation model which underlies the game represents a hypothetical Australian dryland-grazing and cropping farm located in the Central Tablelands of New South Wales. The participant-manager is engaged to plan and implement the development of the property over at least the ensuing five years. At the beginning of the exercise all participants are assigned identical 800 acre farms consisting of two soil types, carrying no livestock, with no crops in the ground, no fodder on hand and no machinery. There is a residence for the manager, a general-purpose shed, a shearing-shed, a sheep-yard and a good stock and domestic water supply. Each participant-manager is provided with a copy of the owner's instructions which represent the rules of the game. This manual of instructions details what enterprises the manager may engage in and provides background information about the farm. It also indicates how the manager is to record his decisions. Within the framework of the restrictions imposed by the owner, the participant-manager is free to plan the development of the farm and to implement this plan. The enterprises he may employ are pastures (including lucerne), wheat, potatoes, fat-lambs, merino-wool production and beef cattle. In broad terms the manager is required to decide upon which of these enterprises he will use, in what way, and at what level, while at the same time allowing for the maintenance and the development of the assets under his control. However, the game calls for decisions at much more detailed level. For example, the participant-manager must decide:

(a) which pasture species to sow and at what seeding rate;

(b) what cropping operations are required and when;

(c) when to buy and sell livestock and fodder;

(d) when to perform the various operations such as shearing, branding, and mating;

(e) what machinery and structures are to be purchased and when;

(f) what fencing and clearing is justified;

(g) whether to purchase more land;

(h) what method of finance to employ;

(i) whether to hire permanent labour; and

(j) when to use contractors.

In other words, the participant-manager must constantly weigh short-run tactical decisions against his longer-run strategic plans.

In any one run of the game all farms are subject to the same stochastic simulated weather and marketing environment. The independent decisions of each manager are combined with these environmental factors to determine the outcome on his particular farm. The results for each farm are presented to the participant-manager as monthly physical and financial summaries. At the end of each year the manager also receives a full set of managerial accounts covering the operations for the year. From these accounts the manager must derive a set of taxation records and file an income tax return for the farm. The feedback of both the past environmental data (rainfall and market prices) and the results of his earlier decisions provided by this exercise, forces the participant to face much the same decision-making situation as that faced by a real farm manager.

Appendix A-1 is a copy of the record of monthly activities for each particular farm. There is a maximum of 385 decisions possible in any one month. To initiate the game a set of parameters was set, one of which was a random number between 1 - 999. This number seeded the random number generator in the computer, which in turn set up the stochastic process within the program to generate rainfall and market conditions. This feature became an asset during the redesign of the program. The game was run several hundred times with different seeds, to see what conditions were set for each number. It was found that one set of numbers created extreme drought conditions, another set created very wet conditions etc. By deliberately selecting the seed, it was then possible to create specific weather and market conditions, and then observe the various strategies farmers adopted under these conditions.

Appendix A-2 shows a sample output from the original CTFMG program. It was the result of decisions set in Appendix A-3. This output contained all essential details of the farm, including environment conditions, market conditions, livestock, pastures, fodder, machinery, labour and finance conditions. This output was designed as the major feature of the game, to provide economic decision making data. When used with farmers initially it was found that this output was both confusing and largely, redundant.

Therefore it was decided to modify the output in two ways. First, all tables were numbered and made optional. In this way the participant need select only that information that was relevant to him at any particular point in time. This gave an additional measure of management behaviour in that one could observe what information the participant required to make decisions. The second modification involved reducing the output tables to a suitable width to fit on a computer terminal. The normal character width of a terminal is 80 characters, while that of a line printer is 132 characters. (Some terminals are also 132 characters wide.) In adapting the output to terminal operation, the input features of the program were also modified to allow all parameters and data to be input in free format from a terminal. Thus the game became an interactive game allowing the participant to make decisions at the keyboard and get results back immediately on either a video display unit or as hard copy on paper. These modifications and trial runs both with students and farmers took a period of two years development before the interactive version of the CTFMG was working satisfactorily. Appendix A-4 shows the complete output from this modified version using the same set of decisions from Appendix A-3. Each table in Appendix A-4 is an option, the minimum output is the rainfall registration and the bank balance. During its testing period it was found that economics students tended to want all tables, while farmers asked for a minimum number of tables, and only asked for specific tables at certain times of the 'year'.

Even though the development of an interactive version of CTFMG speeded up access time it was extremely difficult to get farmers to play the game at the University. It was remote from their work, and meant being away from the farm for a few days. To overcome this deficiency meant taking the game to the farmer. To achieve this an application was made to the Australian Advisory Committee on Research and Development in Education for a research grant to purchase a portable computer terminal. The grant was awarded to the author in November 1973, and in April 1974 a model 725 Texas Instrument portable terminal was purchased. The terminal has an Acoustic Coupler, a device to interface the terminal with the computer via an ordinary telephone. Thus, the simulation game could now be taken to the farmer's own house and played in his own natural environment. To play the game only required dialling up the computer by phone, and placing the hand piece in position. All programs were resident on disc at the computer, so that there was a minimum of delay in interfacing the farmer and the game. Before commencing work with the terminal, approval to operate the terminal through the telephone network was sought and granted by the Australian Post Office. Permits to operate in each

State were necessary, but as the work was carried out within Victoria, only one permit was obtained. This allowed the use of the device on any S.T.D. network at transmission speeds up to 30 characters per second (300 BAUD). The one stipulation of the permit was that it not be operated through telephone switchboards, as they tended to generate transient signals when switching, and these transients were accepted by the acoustic coupler as data.

Thus, in terms of the first requirement of the proposed testing procedure, an adequately controlled external environment was now available. The controlled management environment was represented by the simulated farm, whose parameters could be manipulated, and the positive feedback to the farmer was provided via a portable computer terminal which accepted data and reported results within a few minutes. More importantly this environment was given a boost of realism by taking the terminal into the farmer's own home. In practice this would be his normal management environment: surrounded by wife, children and the many interruptions from small tasks which have to be carried out on his farm.

In practice it turned out that farmers were in no way put off by the terminal, and very quickly became involved in the game when it was used in their own home. When it was used in a remote setting, typically an office in the local Department of Agriculture, the farmers did not feel at ease and were more reluctant to become involved in the exercise.

# CHAPTER 8

## The Farm Management Grid

Having provided a suitable external environment for the farmer it remained to design a suitable measuring instrument to elicit the management construct system. Although Kelly's REP test has limitations in measuring cognitive processes, it still remains an adequate measure of cognitive structure. In fact, the grid is not an instrument tied to any particular theory. Tutton (1972) referred to the use of the grid as a generalised grid technique for measuring the content and structure of a cognitive system. As such it is tied to no theoretical base and accompanied by no definite rules for application and construction.

The objective of the present study was to elicit farm management constructs with the grid technique in a simulated management environment. By applying a series of grids in this environment one should be able to measure the process of change, i.e., learning, as it occurred in this context. One way of standardising the procedure was to use a fixed set of constructs and elements, and have the farmer rank the elements on each construct. A second method was to use a fixed set of elements and elicit the constructs. In both of these approaches group data were possible. However, in the present study no attempt was made to determine group profiles. The objective was to observe the learning process in each individual case, and *a posteriori*, note strategies that were similar in some way. The third, and chosen method, was to allow the farmer to choose his own elements and elicit his constructs about these elements. A list of likely elements, Appendix B-1, was presented as a guideline, but quite often, the elements emerged from the strategies adopted during the process of playing the game. After pilot testing this procedure on eight farmers, the technique adopted was to elicit the elements from the game for the first grid, then elicit subsequent elements from the game plus any areas of interest that emerged from the first grid.

In order to create positive feedback from the grid analyses, a suitable medium was developed that was non-threatening to the farmer. Typical multidimensional program analyses generate inter-correlation matrices, factor scores and loadings and a host of other statistical information that often baffles even the psychometrician. On the other hand, a simple graphic plot of the data was sufficient to indicate the underlying structure of the data. Slater's INGRID 72 produced loadings which, when plotted, gave a much neater visual display of the structure. In terms of useful visual feedback of the results, INGRID 72 gave a perspective of the data.

In order to utilise INGRID 72 more fully, a plotting routine was added to the program. The routine rescaled the principal component loadings from INGRID 72 and plotted a two dimensional graph from them. As well, it gave several plots showing the relationship among all specified components. Thus if one specified a three dimensional solution, three graphs were plotted, components one with two, one with three and two with three. More importantly, the plot routine was written so that it could be outputted onto a terminal. In addition, all other tables of results from INGRID 72 were made optional outputs. The input was modified to accept free formatted data from the terminal. Thus INGRID 72 was also converted to an interactive program with all output made optional, and a plot routine added.

Thus the interactive version of INGRID 72 became INGPLT and represented the second major positive feedback feature of the present study. INGPLT was then available at the time of the experiment, and, along with the interactive version of CTFMG, was used with the farmer to examine the cognitive structure of his farm management construct system.

In pretests of INGRID 72 results, hand plotted on graph paper with major axes outlined, it was found that subjects tried to group their elements in terms of the axes of quadrants. As well, the scales on the axes led them to try and give some meaning to the metric distances between points. Therefore, INGPLT was designed without axes or metric scale values on the output. As seen in Appendix B-2 the output was a simple outline of a square with points plotted inside the square. In presenting INGPLT results to subjects, they were told that the computer had sought out the patterns of thought (constructs) generated by the REP grid and represented this pattern of elements and constructs as a scatter of points. Their interpretative task was to inspect the plot and see if in fact the computed patterns accurately reflected their own thinking. This was achieved by then asking the subject to draw boundaries around the sub-set of elements that went together, and to try and identify the meaning of the sub-set in a few words.

From a measurement point of view this rather loose, subjective interpretation of a principal components solution of the grid data may seem inadequate. However, metric results, factor loadings etc., are produced to guide the researcher in giving meaning to data. In the present instance the researcher was NOT interpreting results; the subject was interpreting his own data, and needed no metric guide to his own thinking. In fact, the ease with which subjects could give meaning to sub-sets of elements and constructs, and also handle subjective 'distance' between elements and constructs of their own data, substantiates the claims of non-metric multidimensional measurement techniques. The exact meaning of distance or order depends on the subject's own interpretation of similarity. To this extent then, he was a much better interpreter of the metric representation of his own data precisely because he alone knew the meaning of the 'distances' represented. It was interesting to note that this interpretation was time dependent, as Kelly would have predicted. Again in pre-tests of presentation of grid data, where results were not presented for a week in some instances, and two months in two extreme instances, the grid had little meaning to the subject. The real benefit only accrued when the results were fed back within minutes of doing the grid. At that point the subject was still very much aware of the meaning he had put into the grid. Thus INGPLT was a powerful positive feedback technique in that it could present results to the subject within five minutes of completing the grid. If one accepted Kelly's hypothesis that "the person is ... himself a form of motion", then the value of INGPLT lay in its ability to allow the subject to examine his own relative position in his time stream while he was still at that position. In effect it gave substance to the philosophical underpinning of Kelly's theory:

> "... each man contemplates in his own personal way the stream of events upon which he finds himself so swiftly borne."
> (Kelly 1955)

The development of INGPLT as a positive feedback system would seem much closer to Kelly's ideal than even Slater's or Fransella's use of INGRID 72, for it overcame the problem of time delay in testing a theory which was time dependent. Kelly foresaw the value of building a three dimensional grid but at times regarded it as a formidable undertaking. His idea in proposing the constructed model was stated as follows:

> "If we can look upon our subject's list of constructs as a set of reference axes with respect to which he plots the behaviour of those persons with whom he lives, we are immediately confronted with the notion of psychological space .... similar to Lewin's 'life space', since it is structured in terms of the subject's personal set of axes.

> "Now we can start asking ourselves certain types of questions about this subject's psychological space .... we will want to know what alternatives this client is likely to see open to him if he should be prodded into a premature decision".
> (1955)

However, it was the present author's belief that Kelly stopped short in accepting the logical consequences of his own theory. In postulating the grid technique as a method of representing the person's own construct system, Kelly restored to the person the freedom and dignity of understanding his own construct system. His objective in obtaining such a grid would seem to revoke the person's newly gained freedom. For Kelly immediately dropped back into the role of the clinician who takes upon himself the role of interpreter.

> "We shall seek not only to describe a client's acts, but to understand the anticipatory implications involved in the channels through which he initiates them."
> (1955)

It was important then to distinguish between two possible uses of the grid. As a clinician, Kelly saw:

> "the object of this kind of enquiry is to see how the client structures a world in relation to which he must maintain himself in some kind of a role".

That is, the clinician sought to understand the person's construct system. Alternatively one could postulate that it was not necessary to understand the person's construct system; it was only necessary to provide him with a means of representing his own construct system that has meaning only to himself. By providing the means one was providing him with a new insight into his own system. Whether he chose to act on this insight was a personal decision. Kelly foreshadowed this alternative in stating if you do not know what is wrong with a person, ask him; he may tell you.

There was of course a need for both alternatives. In the case of psychologically disturbed people, the clinician obviously has to take an active interpretative role to assist the person to understand possible causes of disturbance. But the second alternative seemed more relevant to non-clinical situations where the person was capable of self interpretation.

It was the central contention of the present study that the area of adult or continuing education was one such fertile, non-clinical situation where the second alternative offered a powerful adjunct to the educational process. The following chapter describes how this contention was put to the test, using INGPLT primarily as a vehicle for personal insight, whilst a computer simulation game was used to create a learning environment.

## CHAPTER 9

## Research Design

Experimentally, the design was quite simple. Underlying its simplicity however, was a great deal of technology and multivariate statistical design. Adopting Kelly's model of farmer-the-scientist, the research program set out to elicit management constructs from the farmer and explore with him his management construct system. By providing positive feedback from a series of grids, it was expected that the feedback would initiate a learning process as the farmer actively explored the dimensions of his own construct system. Learning was taken here in the Kelly sense, that is, as an act of reconstruction. Underlying each individual's management style, it was expected that there would be some elements of management in common, which represented the transmitted experiences accumulated by many generations of farmers.

To facilitate recall of management constructs, the computer simulated CTFMG was used to create a controlled, and as realistic as possible farm management environment. In the original study (Salmon 1976), three sets of data were collected for each subject. The initial set of farm decisions for each month was available as data on the basic management strategy adopted by the farmer. The CTFMG outputs were available as data on the corresponding physical and economic behaviour of the farm. Taken together, these data provided an objective measure of the farmer's management behaviour and thinking. The second set of data comprised the grids with their individually selected elements and elicited constructs. As well the graphic plots and their interpretation provided insight into the subjective behaviour of the farmer. Comments made by the farmer when exploring the plots offered evidence of the actual learning (reconstruing) process that occurred. Finally, some brief biographical details were collected to give some background information on the farmer.

The research design was not meant to encompass a representative sample in order to elicit some general objective or subjective management strategy. Therefore no attempt was made to sample the farming population. Nor was the design meant to validate Kelly's theory. Rather, the object was to test empirically a psychological testing procedure henceforth referred to as a *dynamic testing procedure* to measure cognitive change, as evidenced by reconstruction or learning. Once developed the concept of dynamic testing could well be used on statistically sound samples to gather parametric data on management behaviour, or any other behaviour where change occurred. The original results (Salmon 1976) were confined to case studies of each administration of the dynamic testing procedure, and the discussion evaluated its potential usefulness and shortcomings.

## Research Procedure

The procedure used by Salmon (1976) is reproduced here to show how the dynamic test was used.

After selection of a farmer by either the Department of Agriculture or the recommendation of a group of farmers, a time and day was set for the interview. In some cases farmers selected were interviewed in an office of the Department of Agriculture. The remainder, were visited on their own farms. This meant that the environmental setting for the exercise was made even more realistic in that the farmer was accustomed to his own home and his decision and management environment. In each case, the farmer had a room prepared, usually the living room or kitchen, with table space and access to an electrical outlet and telephone.

Upon arrival it was necessary to reduce feelings of anxiety created by the computer terminal and the exercise. In every case the farmers were under the impression that they were going to work with the computer, which lead to opening remarks such as "I don't know anything about computers so I probably won't be much use to you". This mistaken idea stemmed from the poor description of the exercise given by Department officers who themselves knew nothing of the procedure, but referred to it loosely as "plugging farmers into a computer to analyse them". However, it was a simple task to dispel the farmer's fears of what was going to happen, and in fact this act of explanation served as an excellent step toward establishing rapport with the farmers, and collection of biographic data.

The exercise began with an informal explanation of the present attitudes of rural educators toward farm management education, and the role they saw for more formal instruction in management to keep the farmer abreast with new technologies and economic restructuring of the industry. It was pointed out that most attempts at farm management education failed to take into account the practical knowledge and experience in management already possessed by the farmer. Therefore, the purpose of the present exercise was an attempt to understand the management principles and philosophy already in use within the rural industry. In this way economic and new technological management procedures could be integrated with existing experience by the educator, rather than attempting to replace experience with theory.

This opening discussion with the farmer invariably draw approval plus a lot of personal comment on some or all of universities, agricultural colleges, Department of Agriculture, private consultants, commercial firms and the government, all of whom constituted "the bloody experts" who try to tell farmers what to do. At this point the farmer became most interested in the exercise and asked what he had to do. The exercise was explained as having two components. The first involving a farm management game, and the second involving an exploration of the farmers' understanding of management.

The game was outlined as follows:

> "I want you to imagine that you have just taken on the job of managing a farm for an investor. The property is 800 acres of pastures and native timber. It is located on the tablelands of New South Wales near Bathurst, and I can give you all the relevant information on rainfall, temperature and soil types. The farm is in a run-down condition with no stock, or equipment, but the fencing is in good order and water plentiful (at this point the subject was given a plan of the farm, Appendix C-1 and shown a model of the property). The owner has given you five years to develop the property and turn it into a profitable investment. You will receive a monthly salary of $250, and you are not expected to work any more than 160 hours a month. There is an adequate manager's home on the property. You can develop the property along any lines you wish; there is a number of enterprises suitable in the area, including cropping, pasture development, sheep, cattle or potatoes. However, the owner has laid down certain conditions for each enterprise development. You will also have finance available to you, including starting capital of $10,000 dollars. The owner has specified that you should not use overdraft as a form of borrowing, and that you must not let the owner's equity in the property go below 80% for any extended period. The best way to start would be for you to ask me for whatever information you may require before making your management decisions" (an abridged version of the Longworth's (1973) Manual for Participants).

The farmer would then ask some questions about the physical characteristics of the area. At no point were any guidelines laid down to suggest how the farm might be organised. This was a vital part of the procedure for the farmer was expected to call upon his own experience in managing the farm, rather than follow a set of rules. Invariably the farmer remarked that he would choose only those enterprises with which he had experience, and in one case only did a farmer venture into an enterprise in which he had no previous experience.

During this period of setting up the initial operation of the farm, the farmer was encouraged to explain informally each of his decisions. These were written down, and shown to him at the end of the initial decisions period. He was then asked to briefly explain his underlying strategy in managing the farm, and what final outcome he expected to reach. Aided by his own comments, a farmer had little trouble in stating his adopted management strategy.

At this point, a rough programme was drawn up of all the operations the farmer wanted to perform on the farm. Appendix C-1 was an example of the layout used to plan his decisions. These decisions were rechecked with him and then coded on prepared data sheets ready for entry as data in thesimulation exercise (Appendix C-2). To occupy the farmers' time while the data were being entered at the terminal the second phase of testing was initiated. Surprisingly most farmers watched the terminal for only a few minutes and then returned to the test. Thus, the terminal/computer operation did not create any difficulties or raise anxiety once the farmer saw it working and realised he did not have to touch the terminal.

Phase two involved the administration of Kelly's REP test. A 20 x 16 blank grid matrix was used, with each element being randomly assigned to a triplet at least four times (Appendix C-3). The farmer was asked to select fifteen aspects of farm management which he thought were important in his own decision making. A list (Appendix B-1) of suggested aspects was shown to him but it was stressed that he was not confined to the list. As well, he was encouraged to look back over the comments and decisions made for the simulation run. Once fifteen elements were elicited, they were randomly assigned to the grid with the sixteenth element, "SELF", always occupying the first column position. He was then asked to look at the three elements indicated in row one by the three sets of brackets, and to decide in what way two of them were alike, and the third one different, in relation to his making farm management decisions. He was asked to tick the two elements alike and cross the element different, and then write down on the adjacent sheet (Appendix C-4) the reason why they were alike/different, (construct). The farmer was then asked to work through all twenty rows of the matrix. During this period the input data were entered on the terminal into the farm program, and the appropriate results obtained.

Once the farmer had finished the first REP test, the INGPLT program was called up at the terminal, and the REP data subjected to analysis. During this period the farmer was asked to read out the data while the author keyed it into the terminal. In this way he was kept occupied by involvement in the analysis. He was asked to convert ticks to a "one" (1) and crosses to a "zero" (0). This had the added advantage of the farmer being able to interpret correctly any errors he had made, e.g., a tick changed to a cross etc. The results for INGPLT were then laid on the table and the farmer was again involved by asking him to call out the elements and constructs corresponding to the numbers on the output graph (digits 1-20 represented constructs, and digits 41-56 represented the elements).

Next, the farmer was invited to examine the plot. He was told that the elements were scattered within the plot, but some tended to cluster together. The plot was explained as a visual representation of the elements as he saw them in his own mind. Thus any clustering was due to him seeing a closer relationship between those clustered elements and the rest. He was then asked to place a boundary around those elements he thought would go together. He was also asked to label the clusters. The constructs were explained as the set of reasons he used to derive the clusters. Thus the constructs clustering near the element clusters gave him insight into their interrelationship. Finally he was encouraged to talk about the meaning of the clusters, explain any apparent anomalies and comment on how well he thought the plot represented his management thinking. Discussion then returned to the farm results, and each set of monthly decisions were carefully examined to check if the farm was developing as expected. The farmer then prepared his next set of decisions for a second simulation view. Again the grid was re-applied after eliciting a new set of elements based on what he had learned during the exercise up to this point. This procedure was repeated three times or less if the farmer requested it.

Each step in the above procedure was designed to create maximum involvement of the farmer in the decision making, construction, administration and interpretation of results. The author tried not to bias any decision or interpret any result. To this extent the procedure was unique for each farmer, and he had plenty of latitude to pursue the exercise in any way he wished. Thus the concept of dynamic testing covered both the process of learning that occurred during the playing of the game, and the administration and interpretation of the REP test, and the flexibility the subject had in selecting a sequence of tasks. In the majority of cases, farmers chose not to continue the farm game, but preferred to explore their own management constructs by repeating the REP tests with different elements. When a suitable conclusion was reached, the exercise was terminated and if it was on a farm, the farmer was paid by cheque for S.T.D. time used on the phone.

# CHAPTER 10

## Illustrated Case Studies

To illustrate the Dynamic Testing Procedure, two case studies from Salmon's (1976) original sample are shown in detail. They are of particular interest in that they represent a father and son, and hence reflect the problem of intergenerational transfer of knowledge and land management. For confidential reasons, these subjects are identified only as Mu (father) and Gamma (son).

Mu was an interesting subject from many aspects, not the least being that he was the father of subject Gamma, a young dissatisfied farmer. From this aspect alone, the two cases provided insight into two sides of the father-son problem in family farming. A second point of interest was not directly related to the research, but provided an unexpected bonus in assessment of the testing technique. Apparently parental relationships with Gamma were poor up until the time of the testing. Mu was an experienced sheep and beef farmer, but was not too happy about 'playing the farm game'. He thought it was another diversion of his son, who had in fact suggested his father as a possible subject. However, he became quite involved in both the game and the grid tests. Several weeks later, Gamma contacted the author and expressed his thanks for providing a communication bridge between his parents and himself. The game had become a common point of interest, and they were able to discuss their respective approaches to its management. In doing so, it opened the way for deeper discussions between them on the management of the family farm, and allowed a lot of misunderstanding to be cleared up that had lead to the gradual rift between the father and son.

Mu's son Gamma managed a farm near his father's property. He and his wife owned 30% of the farm, while the remainder belonged to his parents. Gamma had left school to attend an Agricultural College, where he completed a Diploma of Agriculture. He then returned to the family farm engaged in fine merino wool production and beef cattle. Gamma's wife came from an urban background, and had worked as a typist and later as a teacher. Gamma represented an interesting example of a growing phenomenon in Australian agriculture, the young, dissatisfied farmer who wanted to leave farming and find a more interesting job in an urban setting. As the results showed, he followed farming as a matter of parental choice, a pressure which later lead to a deep rift between Gamma and his family. During the earlier part of 1975 when wool prices were low, and the beef export industry had collapsed disasterously, Gamma was forced to seek off-farm work to support himself and his wife. With rural unemployment running high, jobs were not available, and Gamma, like so many other farmers in this same predicament, was forced to accept government unemployment assistance in the form of work for the local shire council.

## Farm Game - Mu

Mu was one of the few farmers to play the farm game through for twelve months. In fact he planned a second twelve months for year two, but it was not played through. Mu was also the fastest player in preparing a plan. He asked very few questions about the farm, as he knew the Bathurst-Orange district. He quickly settled on a sheep-wool production and stated his strategy as one of improving pastures to carry at least two sheep to the acre. The first step was to spread superphosphate on all paddocks. He said he would buy merino sheep locally because 'they would already be acclimatised'. He decided

# TABLE 3

## FARM DEVELOPMENT PLAN

### Subject: Mu

### Year 1, 1975

| MONTH | MAJOR OPERATION | STOCK | MISCELLANEOUS |
|---|---|---|---|
| January | - | Buy 500 merino ewes and shear | - |
| February | Spread super on all paddocks | - | Fence 30 chains |
| March | - | Buy 15 rams drench, crutch, mate flock | - |
| May | - | - | - |
| June | - | - | - |
| July | - | - | - |
| August | - | Lamb | - |
| September | - | Work | - |
| October | - | Dip, mules | - |
| November | - | - | - |
| December | - | - | - |

not to clear for a few years, and see how his finances would hold. 'Play by ear for a few years'. Mu was interested in blocks A and B but again decided to wait. The same thinking was applied to machinery. He would not buy any in the first twelve months, but contract all work requiring machinery. His only modification to the property was to fence 30 acres for hay. Thus Mu's plan was very conservative, for he 'preferred not to take risks'. He certainly would not entertain the idea of borrowing money. Table 3 shows the strategy developed.

As can be seen from Table 3 Mu made no innovative decisions but adopted an extremely conservative strategy with a simple sheep husbandry program. His intention was to sell his wool, and continue to breed up a larger flock as the pastures improved. In year two he said he would consider borrowing money to buy machinery and sow permanent pastures. As analysis showed, Mu's conservatism was reflected in the very low number of hours worked, and the lack of any substantial development on the property other than the addition of stock and super. Despite good rains, Mu was forced to buy fodder from February to April, and again from June to September. Mu finished up the year with only 386 ewes, and 424 lambs, and $2,575 in debt. On these figures, Mu had little chance of making a substantial profit from lambs or wool in year two. Thus he would be forced to borrow heavily if he was going to develop the farm into a profitable enterprise.

Mu's conservative approach to the farm was surprising, given the wealth of experience he had in farming. Yet he was quite happy at the end of the twelve months that he then had a better 'feel' of the farm, and stated that he was prepared to take a few risks in the second year. Thus his conservatism was not a static frame of mind but rather a part of his management style in that he preferred to make judgements based on experience rather than on figures.

This was borne out in a long discussion on his philosophy of sheep husbandry. Again, he was conservative here, preferring to breed one blood line to maintain a consistent quality of wool rather than experiment with difficult breeds to produce different types of wool. Mu however, did make an important point. With the introduction of objective measurement of wool, it was no longer necessary for wool breeders to concentrate on breeding programs to gain small improvements in fibre. Micron measurement was based solely on fibre diameter and hence other refined wool characteristics became less important. Thus one could retain a comparatively large fluctuation in wool quality by old standards yet still fall within the same micron category. Mu stated that a lot of work was needed by breeders to understand the full implications of objective measurement on traditional management strategies.

### Grid One

Appendix D-1 shows the elements and constructs selected by Mu as representative of his management concepts. Only 15 were selected for this first grid. As Figure 1 illustrates, there was a scatter of elements and constructs with the first three components very closely matched in the variance accounted for (24%, 21%, 16%). This indicated a truly multidimensional analysis of the data by Mu. His first group was (44, 54) which he called the financial side of management. Group two (41, 43) represented the clerical component. Mu had placed himself close to record keeping, but by this he meant breeding records. He was quite proud of his breeding record which he kept on his whole flock in an effort to obtain uniform quality in wool production. His wife, a trained accountant, looked after all the financial aspects of the farm. Thus he did not regard financial management as an important component of his own management style. Note that 'book-keeping' (55) has been labelled as 'wife's job'. (48),

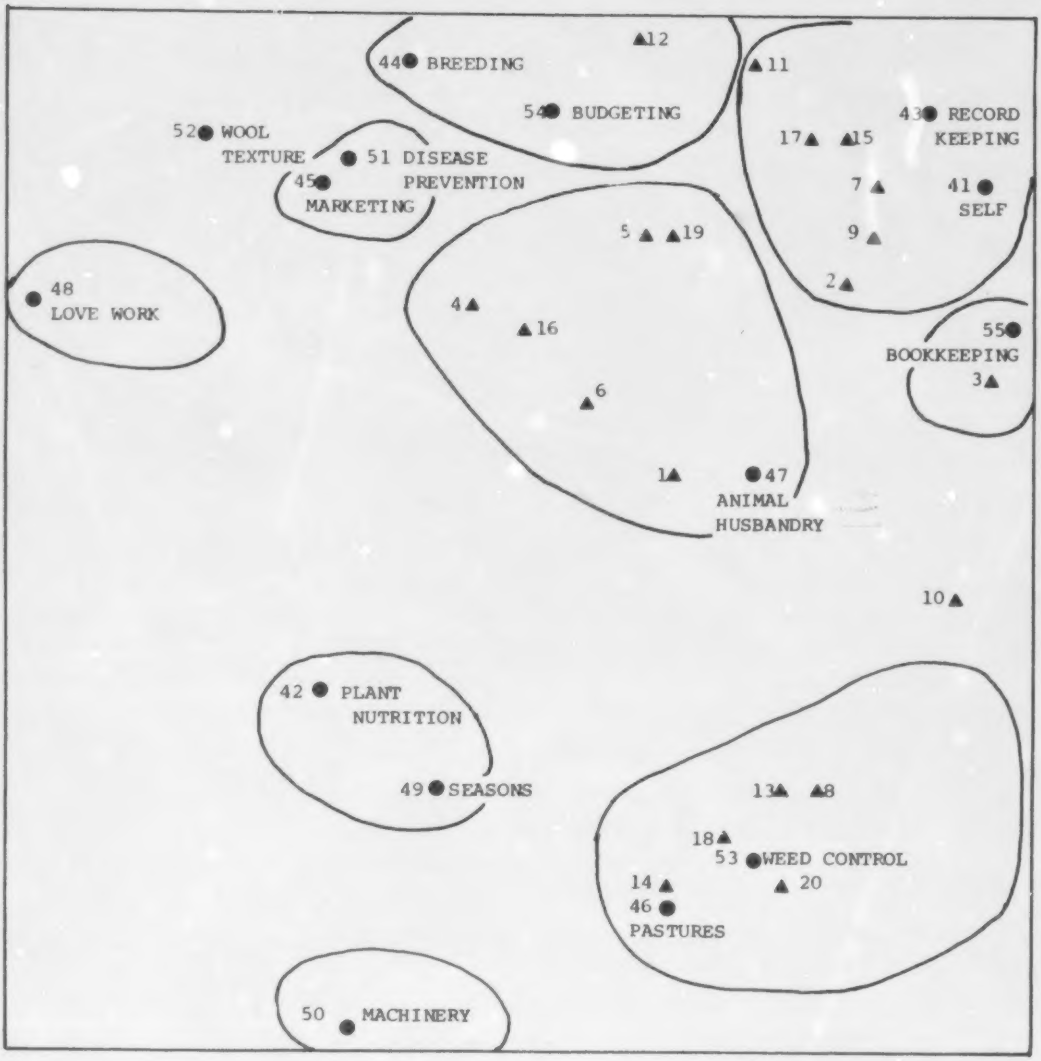
12
44 BREEDING
11
54 BUDGETING
43 RECORD KEEPING
52 WOOL TEXTURE
51 DISEASE PREVENTION
17
15
45 MARKETING
7
41 SELF
5
19
9
48 LOVE WORK
2
4
16
55 BOOKKEEPING
3
6
1
47 ANIMAL HUSBANDRY
10
42 PLANT NUTRITION
49 SEASONS
13
8
18
53 WEED CONTROL
14
20
46 PASTURES
50 MACHINERY

Fig. 1 : Grid 1 Result for Mu

'love of work' was an interesting element. Mu noted it by itself and agreed it was correctly placed. He said it was 'necessary but must be controlled, it should not influence decision making'. Group (47, 1, 4, 5, 6, 16, 19) comprised only one type of element, 'animal husbandry' but contained the largest number of elements, all relating to husbandry. Mu saw this as the practical component of management, as distinct from pasture management, group (46, 53). 'Machinery' (5) was regarded as having 'low priority' in Mu's management thinking.

The grid reflected a surprising degree of complexity, measured in terms of the number of groups to emerge when one considered the simplicity of the farm game strategy. It is worth reiterating that a conservative strategy is not necessarily a static one, and it might now be added that a conservative strategy does not conceal a simple concept of management. On the other hand, given Mu's experience plus his well developed management construct system, perhaps his seemingly simple plan was the result of a sound management approach based on traditional physical management principles. In identifying the two major axes in the plot, Mu had no trouble in seeing the first axis as a financial versus physical management dimension, and the second axis as the mechanics of management versus the control factor in management. Thus for example, quadrant one represented for Mu those elements embracing financial control in management. Mu was quite satisfied with the grid and felt it was an accurate summary of his management thinking.

## Grid Two

Grid two consisted of the people perceived by Mu as influencing his management (Figure 2). Appendix D-2 lists the 15 elements chosen. Unlike the first grid, it was largely unidimensional (51% of variance) and bi-polar. At first Mu circled (41, 47, 52, 55) as a very tight group.

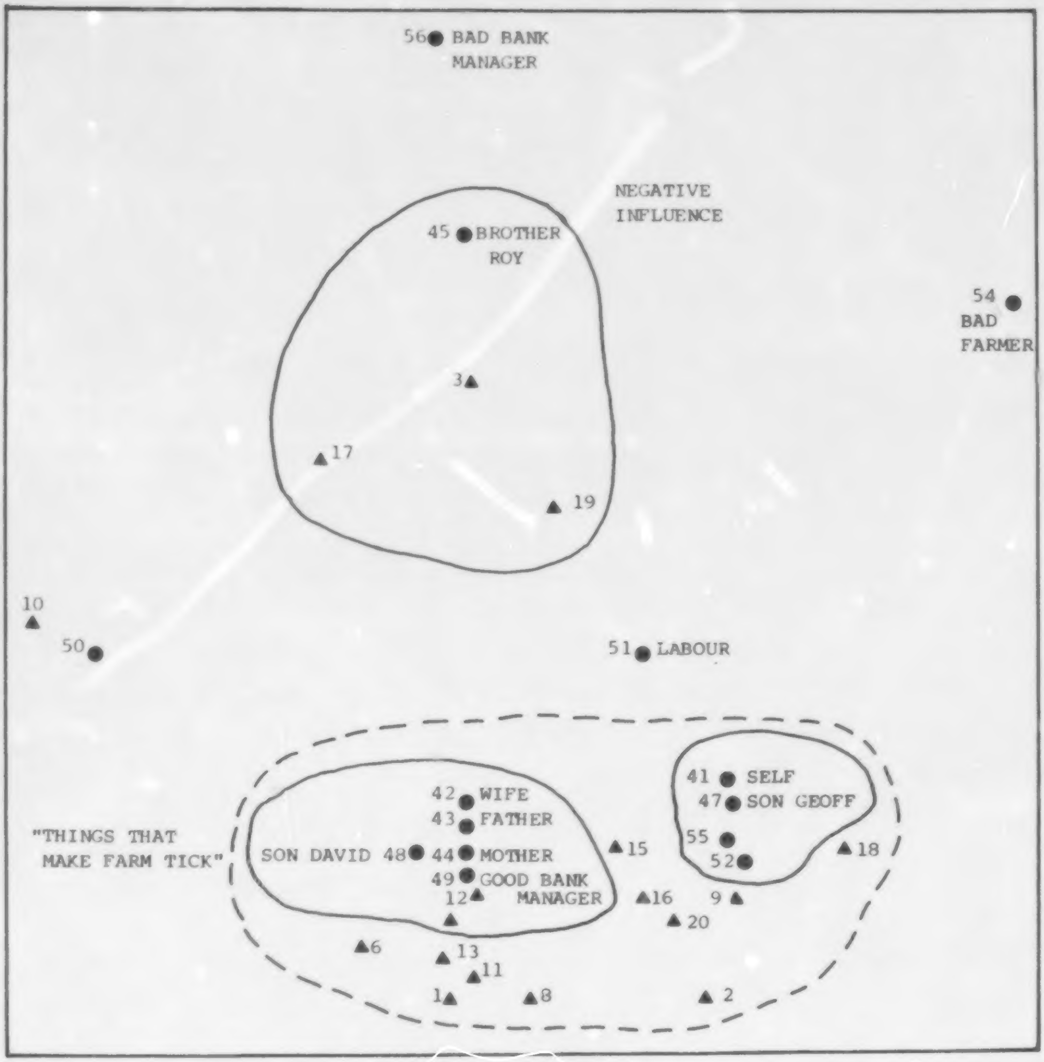
56 BAD BANK MANAGER
NEGATIVE INFLUENCE
45 BROTHER ROY
54 BAD FARMER
3
17
19
10
50
51 LABOUR
41 SELF
47 SON GEOFF
42 WIFE
43 FATHER
"THINGS THAT MAKE FARM TICK"
SON DAVID 48
44 MOTHER
49 GOOD BANK MANAGER
12
15
55
52
18
16
9
20
6
13
11
1
8
2

Fig. 2 : Grid 2 Result for Mu

It included himself, his elder son who had left farming, a neighbour and a sportsman (a second neighbour). He then circled (42, 43, 44, 48, 49), his wife, parents, other son and bank manager. However, after considering all the constructs surrounding these two groups, Mu drew a larger circle to encompass both. He labelled it simply as 'things that make it tick', i.e., the farm. The 'labourer' (51) was left on a limb as 'a necessary evil'. The 'bad bank manager' (56) was put at the opposite pole as the one who 'damn near broke me'. His brother, (45) was also relegated to the group of negative influences in Mu's decision making.

The almost mirror image vector score for element 56 cramped the remaining elements together. A better spread could have been obtained by suppressing (56) and asking Mu to reconsider the altered plot, but time precluded this step. Mu was a worried old man, and did not really want to talk too much about people in the grid. He studied it for quite some time in silence but refused to comment on what he saw. He did not wish to do a third one, as he saw no need for it, nor did he see any problems arising out of the first or second grid. He simply said 'I'm satisfied that they both reflect my feelings'.

## Summary

Mu represented the oldest farmer in the original sample. He was close to retirement, but had fifty years of experience behind him. Taking his farm game together with his grids, Mu had developed a clear management construct system over that fifty year period, and had applied it easily to the game. He did not hesitate in planning the first twelve months, even though it was a simple plan. Clearly experience paid off. However the adequacy of Mu's strategy was another question. Mu quickly disposed of his working capital and left himself in a poor position financially. He would have to borrow in his second year, and this was against his principles. Perhaps Mu was too steeped in traditional management and unable to adapt to a style consistent with present day demands. At his age, it was doubtful whether he would be interested in making a change.

### Farm Game - Gamma

Gamma took a conservative management line in approaching the game. He did not want to raise cattle or crops, he was 'a sheep man - and basically not adventurous'. He opted for a simple pasture improvement plan, and the development of a self regenerating flock of sheep. It was interesting to note that Gamma kept commenting what a bad farmer his father (Mu) was, as well as conservative and lazy. Yet when one compares Gamma's plan with Mu's, Gamma was more conservative than his father, and did not develop his 'farm' as far as his father. Like his father, Gamma refused to borrow capital. However, Gamma did start with a different strategy; he preferred to buy 500 weaners for sale in winter and then purchase 500 ewes and shear them in the spring ready for a December mating. When the self generating flock was big enough he intended to buy the two additional blocks, possibly in the second year. Table 4 shows the simple plan developed by Gamma.

Gamma got off to a bad start with a poor rainfall in January. He was forced to buy fodder in both January and February. His immediate reaction was one of panic, and he remarked 'I think I had better pull my horns in - I want to cool it for a while'.

However, from February on the rainfall improved and pasture growth was sufficient to feed his flock. He had already purchased a tractor and super spreader in January, but when he saw his depleted bank reserves, Gamma borrowed $3,844 in March. Apart from a heavy work load in January spreading super, Gamma worked few hours for the rest of the game. This low work load and conservative attitude of letting the flock regenerate, seemed characteristic of all subjects who opted for a wool production enterprise structure. Those who developed the total farm with a mixed enterprise strategy certainly 'worked' longer hours and carefully structured their work load. Gamma sold his flock in two halves,250 in July and the remainder in August. His intention was to then buy ewes in full wool, shear them and mate in December. However, he did not play past August. Gamma was the only player to ask for market reports. He bought his weaners in January hoping to make a profit on them in winter. He paid $4,450 for 500 weaners which he sold for $5,342 for a profit of $892. However $71 for drench, and $225 for fodder reduced his profit to $646, a 14.5% gain on his initial investment.

## Grid Results

### Grid One

Gamma's grids proved to be a penetrating example of the power of dynamic testing to show up the close relationship between farm management and personal problems. Gamma continually criticised his father and mother, blaming them for causing the rift between them and himself. Yet it emerged from the grids that the fault lay with Gamma himself, and as Mu's grid showed there was no perceived distance between father and son on the father's part.

Figure 3 shows Gamma's first grid (elements and constructs in Appendix D-3). The major group was circled first (41, 42, 44, 49, 53, 47) and labelled by Gamma as 'reasons for love of farming'. On the other hand (43, 45, 48, 50) were seen as those 'sophisticated skills which have to be learnt'. Thus the major component (41% of variance) reflected management skills which are instinctive or intuitive versus management skills acquired formally. The second axis was a concrete versus abstract component, (55) against (51, 54). Gamma circled (51, 54) and noted 'don't regard myself as good decision maker.' Gamma expressed some surprise at the second component; he expected (51, 54) to be in the bottom group and (55) in the top group. Thus he preferred to see his management

## Table 4

### Farm Development Plan

### Subject: Gamma

| MONTH | MAJOR OPERATION | STOCK | MISCELLANEOUS |
|---|---|---|---|
| January | Top dress native pasture, and improved pasture | 500 XBD weaners | Buy tractor and super spreader |
| February | - | Drench | - |
| March | - | - | Borrow money for machinery |
| April | - | - | - |
| May | - | - | - |
| June | - | - | - |
| July | - | Sell 250 weaners | - |
| August | - | Sell 220 weaners | - |

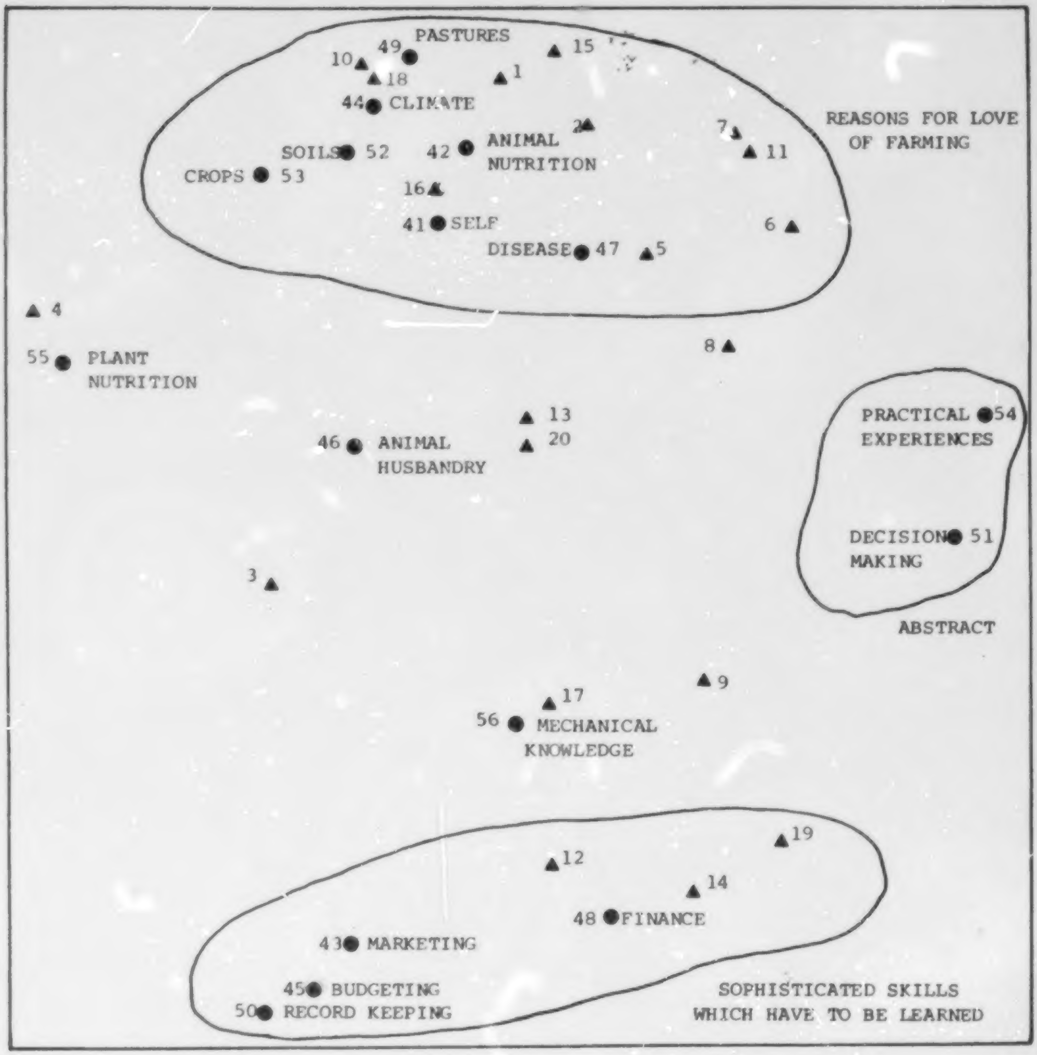
PASTURES
49
10
18
15
1
44 CLIMATE
2
7
11
REASONS FOR LOVE OF FARMING
SOILS 52
42 ANIMAL NUTRITION
CROPS 53
16
41 SELF
6
DISEASE 47
5
4
8
55 PLANT NUTRITION
13
PRACTICAL EXPERIENCES 54
46 ANIMAL HUSBANDRY
20
DECISION MAKING 51
3
ABSTRACT
9
17
56 MECHANICAL KNOWLEDGE
19
12
14
48 FINANCE
43 MARKETING
45 BUDGETING
50 RECORD KEEPING
SOPHISTICATED SKILLS WHICH HAVE TO BE LEARNED

Fig. 3 · Grid 1 Result for Gamma

style in a single dimension, practical experience against learned skills in economics and budgeting. Although this grid was relatively straight forward, Gamma became quite excited at the result and expressed an interest in exploring his personal relationships via the grid.

## Grid Two

As Appendix D-4 shows, Gamma chose a set of elements to cover the range of people he considered having some influence on his management decision-making. As Figure 4 shows, the grid was quite complex although the first component still accounted for 33% of the variance. The first group was (44, 46, 53). Gamma labelled these the "doers", the practical farmers who actually go out and work actively on their farm and carry out innovations in management. His wife was put in this group because she was a 'realist, a pragmatist, who sees new things'. She, in fact, currently managed the farm. To the right was the second group (41, 55, 56) labelled 'the philosophers'. Gamma saw these as people who were 'all talk and no action', the people who talk a lot about what should be done, but never do it. He added the arrow linking the two groups to indicate that the 'doers' listen to the 'philosophers' but prefer to act. Gamma placed himself in this group, but after a few minutes came back to it and added another note, that the community reinforced his self image by calling him the 'farmer who would much rather talk than build fences'. Element (51) was isolated as the good farmer whom the 'doers' watch and imitate, but with whom the philosophers have no communication. The Agriculture Department (47) was seen as redundant, being 'all talk and no action' also; Gamma felt that construct 15 should have been closer to element 47. The next group was (42, 48, 50) which Gamma regarded as the uncreative, bad farmers who live in the past and won't move into new areas.

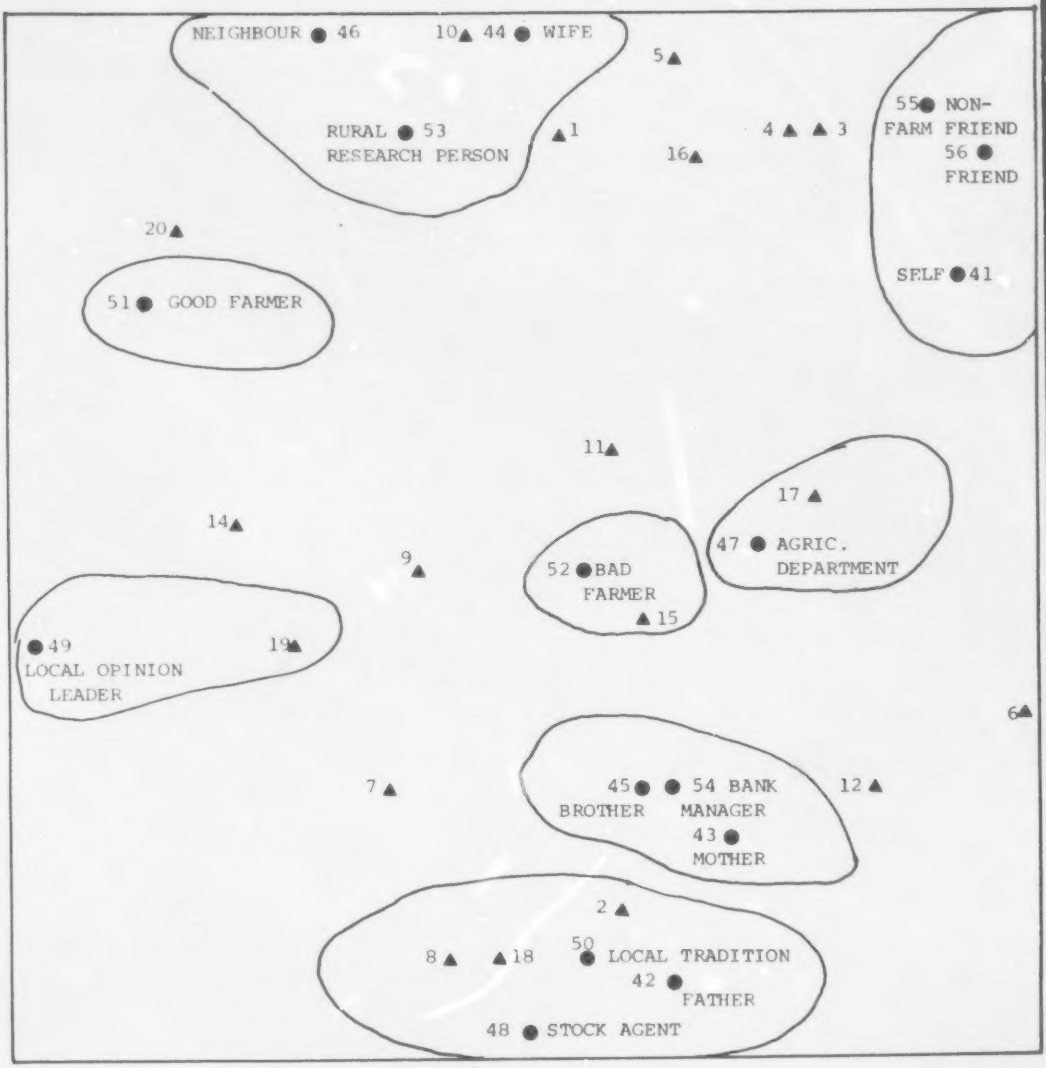

Fig. 4 : Grid 2 Result for Gamma

Element (49) was seen as a person who rejected any questioning of new values put forward by the philosophers, yet realised he must move away from the uncreative group. Groups (43, 45, 54) were seen as a non-farming group who had a financial influence over Gamma's management, and in the case of his brother and mother, Gamma noted that he had been 'scripted to listen to them'. Gamma had attended a T-group session and some group dynamics exercises based on Transactional Analysis.

After spending almost an hour discussing his grid, Gamma was able to label the two components in the grid. Figure 5 shows these components in detail. The first component was a modern versus traditional farm thinking dimension. Gamma felt that the former group was characterised by an interest in the importance of people in farming, while the latter saw farming only in terms of 'what to do'. The second component separated the elements into 'doers' and 'talkers', a calibrated activity dimension. Gamma was pleased with this figure. He then drew in a heavily dotted line between 'doers' and 'traditional farming' saying they were related, and in fact this was where he started from fifteen years earlier. He then added the second dotted line between the other extremes of the axes, and said that was where he really wanted to be, still in agriculture as an 'armchair manager'. He finally added the solid line to indicate the direction he felt he had moved in fifteen years.

Finally, Gamma returned to the grid and pointed to construct 9, 'threatening', and asked why it was in the centre. He answered himself and said 'I am threatened by wife, the Department of Agriculture officer, my neighbour, the stock agent, the opinion leader and the bank manager. I suppose they are pushing me from all sides and I ended up in the middle'. When asked what he meant by threat Gamma replied it was 'a recognition of skills in others which I haven't got'. When asked to elaborate, he said 'let's do another grid on threat.'

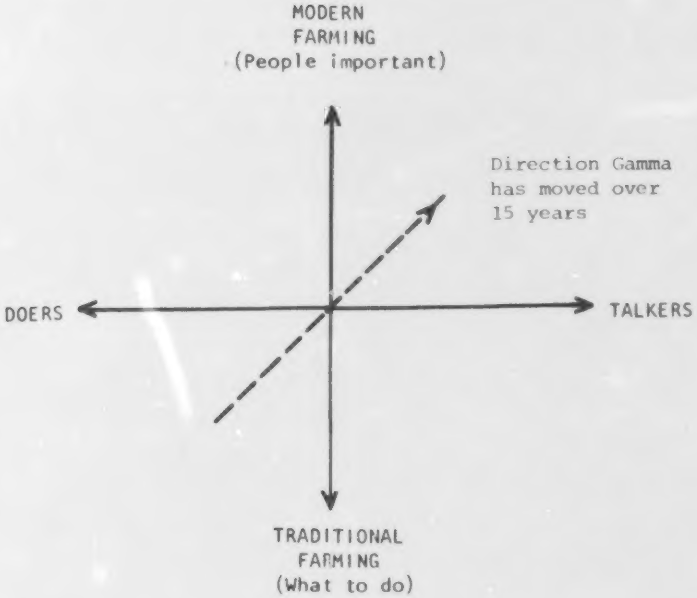
MODERN
FARMING
(People important)
Direction Gamma
has moved over
15 years
DOERS
TALKERS
TRADITIONAL
FARMING
(What to do)

Fig. 5 : Summary of Gamma's Grid

Grid Three

Gamma was now quite excited by the grid, and quickly chose a set of people who were either threatening or non-threatening to him. Figure 6 shows the resultant grid with the first component again taking up 41% of the variance. The first group to emerge was (41, 42, 44), self, wife and neighbour. The repetition of the constructs relating to sex lead Gamma to admit that his wife was sexually involved with his neighbour whom Gamma regarded as a close friend. Both husbands and wives knew about the relationship, but whereas Gamma accepted it, the neighbour's wife (46) was quite hostile. Group (47, 50) comprised a female friend with whom Gamma had a casual sexual relationship, and the sun club, a nudist club which met regularly on the neighbour's property. Gamma noted that this person and the people in the club were non-threatening to him sexually. When asked what he meant by sex, he said there was a strong stereotype of the rugged Australian male which measured sexual prowess in terms of how much regular sexual activity the red-blooded male should have. Gamma then commenced to talk much more freely about his sexual behaviour. Group three (48, 55) was seen as a sexually threatening group. But when he started to talk he said that (55) the teacher's wife was threatening because he felt she wanted to test his 'red-blooded maleness' out, but so far he had not slept with her. Similarly (48), the husband of the female friend (47) was sexually aggressive, and had on occasion involved Gamma in a three-way sexual experience with his own wife, himself and Gamma. Gamma said that he could not cope with this situation very well, and was not sure, after looking at the grid, whether this source of threat may not have stemmed from a fear of homosexuality. He related several stories of homosexual incidents in shearing sheds which reinforced his fears that he might be a latent homosexual. He also admitted some homosexual

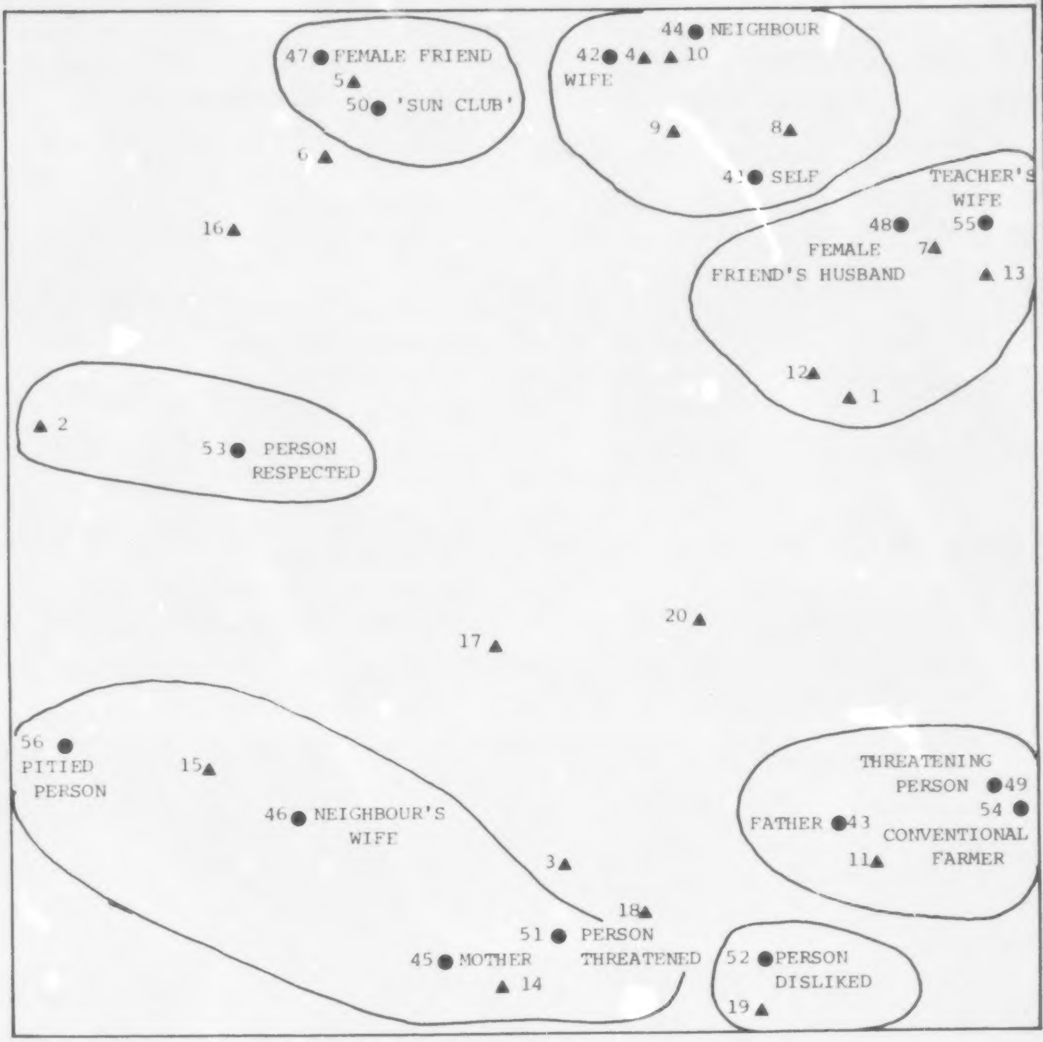
47 FEMALE FRIEND
5
50 'SUN CLUB'
6
44 NEIGHBOUR
42 WIFE
4
10
9
8
41 SELF
16
TEACHER'S WIFE
48
55
FEMALE FRIEND'S HUSBAND
7
13
12
1
2
53 PERSON RESPECTED
20
17
56 PITIED PERSON
15
46 NEIGHBOUR'S WIFE
3
18
51 PERSON THREATENED
45 MOTHER
14
THREATENING PERSON 49
54
FATHER 43
CONVENTIONAL FARMER
11
52 PERSON DISLIKED
19

Fig. 6 : Grid 3 Result for GAMMA

experiences but did not enjoy them. Yet the location of (48) continued to worry him. Element (53) was a person intellectually respected by Gamma, but not seen as relevant to his personal life. The next group was (45, 46, 51, 56) which Gamma labelled the 'lame dogs' who deserved only pity. He saw his mother as a restrained woman who was a 'depressive' and 'got little out of life'. The neighbour's wife was put in the same category because she could not accept what her husband was doing, and was trying desperately to discredit Gamma and his wife. Gamma was particularly harsh on (46), and was unwilling to accept her side of the story, i.e., that she wanted to preserve her marriage for the sake of your young children. Then next group (43, 47, 54) were also seen as threatening, in that they stood for everything Gamma did not want to be, although he said they were all what he used to be, and now they existed like 'the toothache', with a 'dull thud' to keep reminding him of his past. They were epitomised by element (52). It was interesting to note that Gamma separated his parents, rejecting both, but for different reasons. His father was a reminder of his past, yet when one compares Mu's farm game with Gamma, one cannot help asking just how far has Gamma really progressed. His mother was rejected as a pitiful person but non-threatening.

After talking for another hour and a half about grid three, Gamma then drew out the two major components.

Figure 7 shows the axes. He saw the first axis (vertical) as a time axis, with the positive influences on his life now contrasting with the negative influences of his past. The second axis was clearly a threat versus non-threat axis. Gamma then wrote 'History' in quadrant III, indicating that that group of people no longer posed any threat for him. He then added the arrow again indicating his movement up the time axis through life. At this point Gamma became suddenly silent and stared at the axes. After several minutes he remarked, 'My life has always been dominated by threat, all the time looking at

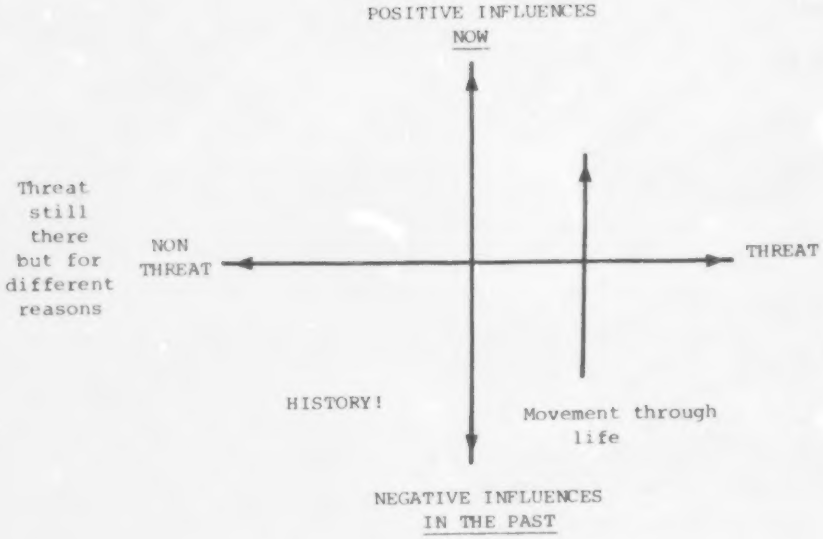
POSITIVE INFLUENCES
NOW
Threat still there but for different reasons
NON THREAT
THREAT
HISTORY!
Movement through life
NEGATIVE INFLUENCES
IN THE PAST

Fig. 7 : Grid Three - Summary Gamma

others in terms of what I am not. It now appears that I haven't really progressed but just substituted one set of threatening people for another'. He saw his original threat coming from farming; now it was seen in terms of sexual inadequacy. Gamma went on to say that he has to learn to accept himself for what he is and stop trying to measure himself in terms of others.

Gamma then talked much more about his wife. For while he accepted her relationship with his friend, he now started to show some anger. He really loved her, but was becoming conscious of the fact that he could well lose her. Already the neighbour was willing to leave his farm and take Gamma's wife. Gamma added that the neighbour had the best of both worlds. He was wealthy, had a good farm, and with Gamma working away a good deal of the time, he also had Gamma's wife. Gamma then said that it was now clear to him that he must make the effort to spend more time at home, and at least decide with his wife where their respective futures lay. And what had appeared as a father-son problem with Gamma and Mu, became a problem of self identity for Gamma, and was not seen by Mu as a problem at all. The relationship between his friend and Gamma's wife was a basic reason for a good young farmer to consider giving up farming.

The problem is a very common one in every community, no matter how large or small, rural or urban. But in the rural community, steeped in tradition, personal problems have little relevance in traditional agricultural research. Thus a good farmer may well become a statistic on the increasing number of young farmers leaving the land. Yet the reasons why they might leave remain buried under economic and technical explanations, with no thought given to social phenomena. Farm management, as it emerged in the original study (Salmon, 1976), may well have a physical and a financial component, but it also has a personal, as well as a community dimension. Thus farm management is a complex behaviour to analyse, and cannot be equated to simple one dimensional variables such as age, income and education.

## Summary

Gamma's farm game showed him as a conservative manager. Despite his criticisms of his father's farming ability, their management styles were remarkably similar. His grid results revealed a depth of identity conflict within Gamma which has lead him to adopt a peculiar position in the management of his farm. He left the practical work to his wife while he indulged in off-farm activities, but retained an interest in the farm.

## CHAPTER 11

## Discussion

The foregoing chapters have illustrated the development of a dynamic testing procedure which has made available a tool to enable a person to achieve an awareness of his construct system and the process of change that accompanies reconstruction or learning. The effectiveness of the procedure was sufficiently evident in the case studies themselves. However, it is now clear that the system could be used fruitfully to explore in greater detail a range of attitude change situations if standardised grids were used to generate comparable data across a large sample.

Howard and Kelly (1954) considered the theoretical implications of measuring psychological movement, but failed to discover a dynamic testing procedure to test their thesis. They looked at the process of change in two areas: therapy and education. The therapeutic situation provides the patient with a framework in which he may structure changes taking place for himself. The therapist aids him in a more rapid realisation of what is happening to him. In the same way, in adult education, a teacher aids a student to understand the process of change occurring within his construct system. Howard and Kelly made an important distinction about the measurement of this change. Measurement implies arbitrary segmentation of time. They distinguished between measured movement, which is variation ascribed to an individual's behaviour by outside observers, and perceived movement, the variation ascribed by the individual himself over two instants of time. In the present research, no attempt was made to measure movement, although this was technically possible. For example, repeated grids using the same elements would produce Cartesian spaces in which the co-ordinates of individual elements could be compared and distance measures derived. However, the present study concentrated on perceived measurement only. Thus the dynamic test concept became a basis for understanding the process of movement. An individual became aware of the variance in his construction system as events were successively construed by him. Thus change may be regarded as a manifestation of the rate of organisation of experience along a time line. Differences in the degree of change between individuals may be viewed as the result of the differences arising in such rates. Howard and Kelly stressed that if the object of therapy was to maximise absorption of new experiences in the briefest time, 'we must devise means for gauging a particular individual's organisation rate'. Yet this was precisely the object of dynamic testing.

Extending the discussion to education, Howard and Kelly accepted that some pupils assimilated knowledge at a faster rate than others. If a student was to attain maximum assimilation or learning in any session he must somehow develop the notion that he was in the process of changing. As he perceived that he was learning, and as he perceived that learning experiences were making him different from what he was, his assimilation rate may be expected to accelerate. Now change measured by objective tests, grades or exam results may fail to reveal movement as extensive as that perceived by the student. Yet, if the student perceived the change in himself it should provide sufficient incentive for further change.

Howard and Kelly concluded that objective tests have too long been overemphasised, and maintained that more stress must be placed upon the individual's perceptions of the learning process. In essence, before an individual can change he must construe change as being potentially available to him. The dynamic testing procedure provided the research tool to measure perceived change as evident in the results. It is not too difficult to see the extension of the tool to the more traditional area of attitude change. Even if one does not accept the Kelly model of man-the-scientist and Personal Construct

Theory, the grid technique still lends itself to testing most theories. Ryle (1975) pointed out that the real power of the grid technique is that it gives the subject a chance to disclose a lot about himself in a short time. What he discloses may be made sense of by any theory claiming to be human psychology.

The solution to the problem of measuring attitude change described in the present study was initially, to redefine attitudes as a construct system in the framework of Personal Construct Theory. The problem of change then became a problem of reconstruction. The measurement of reconstruction used was the REP grid whose analysis and results were carried out by computer and immediately presented to the subject. To elicit suitable constructs, it was found that a controlled or simulated environment relevant to the test topic enhanced the subject's performance. In this instance the topic was farm management education. From the point of view of Personal Construct Theory, teaching and learning are concerned with the elaboration of concepts or constructs, and only secondarily with the accumulation of facts. Didactic teaching consists of feeding the pupil with facts and concepts, ready made. This is the more traditional approach to farm management education. Such an approach fails with adults, as Chapter Three illustrated for farmers, through neglecting to explore first the nature and capacity of the students' pre-existing construct system. It certainly fails by any criteria which measure the students' capacity to cope with new information. The creative act is one in which new relationships and patterns are applied to evidence, yet didactic teaching denies the student the experience of converting new evidence into a search for new constructions.

## Some Recent Applications of the Dynamic Testing Procedure

The preceding chapters traced the theoretical development of the dynamic testing procedure and illustrated its potential. Since its development several other studies have been conducted by the author and postgraduate students in the Agricultural Extension Research Unit applying the technique to a range of research problems. Bock (1976) used the technique to explore beef farmers' use of market information sources and their decision making behaviour in relation to buying and selling stock. Hicks'(1976) work with dairy farmers formed part of the development of the technique. Salmon and Bock (1978) also used the dynamic testing procedure to explore attitudes of rural-urban land users towards regional planning and development. This research proved a valuable input to regional planning authorities. Childs and Salmon (1978) also used a manual version of the procedure on a sample of farmers in Queensland, investigating their management strategies in time of drought. Brewin (1978) interviewed a sample of farmers to determine their attitudes and management strategies in soil conservation practices. Wylie (1978) explored agricultural extension officers' perceptions of their job using the test procedure, and Woog (1979) completed a PhD program in which the technique was used with sixty farmers and extension workers to examine the structure of an intensive animal industry, and its technological training requirements. Woog went on to develop the relationship between the testing procedure and Knowles' adult educational concepts. Anderson (1979) used the procedure in conjunction with a sociological study of rule behaviour among extension officers.

These experiences have lead to further refinement of the dynamic testing procedure particularly in the area of instructions given, and the selection of elements. Some further unpublished applications have involved group dynamic exercises. In each instance encounter groups of less than ten participants each were given the grid early in their development. The elements consisted of all members of the group. Thus the group used the grid to get feedback on each member's perceptions of all other members. The grid plot was first given back to each member, and once they had studied their own grid, they then presented it to the rest of the group. This procedure has proved very popular for initiating a group feedback session, and accelerated the group's development. While one may question the validity of the statistical technique involved in analysing grid data, and perhaps opt for non-metric multidimensional scaling techniques or cluster analysis techniques as being theoretically superior, there can be no doubt about the effectiveness of client feedback. The experiences gained in the above studies consistantly show that people eagerly engage in the process of interpreting their own data. The availability of processed information soon after the completion of the exercise, in an easily readable form, adds a new and rewarding dimension to its interpretation when the client joins the researcher in exploring its meaning. All too often psychologists go to painstaking trouble to construct elaborate tests which yield numeric data, and upon collection of the data, they discard the person and analyse the numbers as if the numbers themselves were the behaviour under investigation. The ready availability of computers and remote terminal facilities gives a new tool to the psychologist who is prepared to engage his client in the process of interpretation. The experiences in this study and others certainly reinforce the George Kelly dictum - if you want to know what a person means, why not ask him.

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APPENDIX A-1

# The Central Tablelands Farm Management Game

# Record of Monthly Activities

Name of the Manager: TEST DATA

Farm Number (1, 2 or 3 etc.) 10 1

Year (e.g., 1971) 11 1976

Month Number (Jan. = 1, etc.) 12 1

Labour Force: Number of permanent employees this month excluding the manager 13

## DECISIONS FOR OAT CROPS

| | | | | |
|---|---|---|---|---|
| *Oat crop number* | | 20 | 40 | 60 |
| *Sowing* | How many acres? | 21 | 41 | 61 |
| | This crop will be sown 1. early or 2. late in the month? | 22 | 42 | 62 |
| | Seeding rate per acre:<br>1. 40 lb. 2. 80 lb.<br>3. 120 lb. 4. 160 lb.? | 23 | 43 | 63 |
| | Nitrogen per acre:<br>0. nil 1. 20 lb. 2. 40 lb.<br>3. 60 lb. 4. 80 lb. 5. 100 lb.? | 24 | 44 | 64 |
| | Superphosphate per acre:<br>0. nil 1. 1 cwt. 2. 1.5 cwt.<br>3. 2 cwt. 4. 2.5 cwt. 5. 3 cwt.? | 25 | 45 | 65 |
| | Soil type:<br>1. basalt 2. non-basalt? | 26 | 46 | 66 |
| *Grazing* | 1. Sheep 2. Cattle 3. Both? | 27 | 47 | 67 |
| | Proportion of available forage to be grazed? | 28 | 48 | 68 |
| *Topdressing* | Nitrogen per acre:<br>1. 20 lb. 2. 40 lb.<br>3. 60 lb. 4. 80 lb. 5. 100 lb.? | 29 | 49 | 69 |
| | Done by: 1. farm labour and equipment 2. contract? | 30 | 50 | 70 |
| *Spraying* | For: 1. redlegged earthmite 2. army worms 3. skeleton weed? | 31 | 51 | 71 |
| | Done by: 1. farm labour and equipment 2. contract? | 32 | 52 | 72 |
| *Haymaking* | 0. (no), 1. (yes). | 33 | 53 | 73 |
| | Done by: 1. farm labour and equipment 2. contract? | 34 | 54 | 74 |
| *Harvesting* | 0. (no), 1. (yes). | 35 | 55 | 75 |
| | Done by: 1. farm labour and equipment 2. contract? | 36 | 56 | 76 |

## DECISIONS FOR IMPROVED PASTURES

| *Improved pasture number* | | 80 | 100 | 120 |
|---|---|---|---|---|
| *Sowing* | How many acres? | 81 | 101 | 121 |
| | Soil type: 1. basalt 2. non-basalt? | 82 | 102 | 122 |
| | Superphosphate per acre:<br>0. nil 1. 0.5 cwt. 2. 1.0 cwt.<br>3. 1.5 cwt. 4. 2.0 cwt. 5. 2.5 cwt.? | 83 | 103 | 123 |
| | Lucerne: 0. (no), 1. (yes). | 84 | 104 | 124 |
| | Permanent pasture mix A 0. (no), 1. (yes). (Victorian perennial rye grass, Woolgenellup sub-clover, and New Zealand white clover.) | 85 | 105 | 125 |
| | Permanent pasture mix B 0. (no), 1. (yes). (Phalaris tuberosa, Woolgenellup sub-clover, New Zealand white clover and lucerne.) | 86 | 106 | 126 |
| | Temporary pasture: 0. (no), 1. (yes). (Short-rotation rye grass H1. Cowgrass red clover and New Zealand white clover.) | 87 | 107 | 127 |
| *Closing up For Hay and/ or Saving* | 0. (no), 1. (yes). | 88 | 108 | 128 |
| *Topdressing* | Superphosphate per acre:<br>1. 0.5 cwt. 2. 1.0 cwt. 3. 1.5 cwt.<br>4. 2.0 cwt. 5. 2.5 cwt. 6. 3.0 cwt.? | 89 | 109 | 129 |
| | Done by: 1. farm labour and equipment 2. contract? | 90 | 110 | 130 |
| *Spraying* | For: 1. redlegged earthmites 2. weeds? | 91 | 111 | 131 |
| | Done by: 1. farm labour and equipment 2. contract? | 92 | 112 | 132 |
| *Haymaking* | Proportion of pasture to be made into hay? | 93 | 113 | 133 |
| | Done by: 1. farm labour and equipment 2. contract? | 94 | 114 | 134 |

## DECISIONS FOR WHEAT CROPS

| *Wheat crop number* | | 140 | 150 | 160 |
|---|---|---|---|---|
| *Sowing* | How many acres? | 141 | 151 | 161 |
| | Seeding rate per acre will be:<br>1. 50 lb. 2. 60 lb. 3. 70 lb. 4. 80 lb.? | 142 | 152 | 162 |
| | Previous crop/pasture was:<br>1. unimproved pasture<br>2. improved pasture<br>3. potatoes or cereal crops? | 143 | 153 | 163 |
| | Superphosphate per acre:<br>0. nil 1. 0.5 cwt. 2. 1 cwt.<br>3. 1.5 cwt. 4. 2 cwt.? | 144 | 154 | 164 |
| | Nitrogen per acre<br>0. nil 1. 20 lb. 2. 40 lb.<br>3. 60 lb. 4. 80 lb.? | 145 | 155 | 165 |
| *Spraying* | For: 1. redlegged earthmite 2. army worm 3. skeleton weed? | 146 | 156 | 166 |
| | Done by: 1. farm labour and equipment 2. contract? | 147 | 157 | 167 |
| *Harvesting* | 0. (no), 1. (yes). | 148 | 158 | 168 |
| | Done by: 1. farm labour and equipment 2. contract? | 149 | 159 | 169 |

## DECISIONS FOR POTATO CROPS

| *Potato crop number* | | 170 | 185 | 200 |
|---|---|---|---|---|
| *Sowing* | How many acres? | 171 | 186 | 201 |
| | Previously the land was: 1. freshly cleared 2. unimproved pasture 3. improved pasture 4. cereals 5. potatoes 6. long-term fallow? | 172 | 187 | 202 |
| | Phosphorus will be banded with the seed to give a $P_2O_5$ per acre rate of: 0. nil 1. 40 lb. 2. 80 lb. 3. 120 lb. 4. 160 lb. 5. 200 lb.? | 173 | 188 | 203 |
| | Nitrogen will be banded with the seed to give an N per acre rate of: 0. nil 1. 20 lb. 2. 40 lb. 3. 60 lb. 4. 80 lb. 5. 100 lb.? | 174 | 189 | 204 |
| *Scuffling or Hilling* | 0. (no), 1. (yes). | 175 | 190 | 205 |
| *Spraying* | For: 1. insects, 2. weeds? | 176 | 191 | 206 |
| *Slashing* | 0. (no), 1. (yes). | 177 | 192 | 207 |
| *Digging* | 0. (no), 1. (yes). | 178 | 193 | 208 |
| | Done by: 1. farm labour and equipment 2. contract? | 179 | 194 | 209 |
| | Proportion stored rather than sold? | 180 | 195 | 210 |
| *Sales* | Proportion of stored potatoes sold? | 181 | | |

## DECISIONS FOR SHEEP ENTERPRISES

| *Flock* | | XBD | MERINO |
|---|---|---|---|
| *Purchases (Store Stock)* | Timing of the purchase:<br>1. early or 2. late in the month? | 220 | 250 |
| | No. of lambs | 221 | 251 |
| | No. of mixed sexed weaners | 222 | 252 |
| | No. of carryovers/wethers (i.e., > 1 year) | 223 | 253 |
| | No. of ewes | 224 | 254 |
| | No. of rams | 225 | 255 |
| *Sales (Fat Stock)* | Timing of the sales:<br>1. early or 2. late in the month? | 226 | 256 |
| | No. of lambs | 227 | 257 |
| | No. of mixed sexed weaners | 228 | 258 |
| | No. of carryovers/wethers (i.e., > 1 year) | 229 | 259 |
| | No. of ewes | 230 | 260 |
| | No. of rams | 231 | 261 |
| *Mating* | What proportion of ewes? | 232 | 262 |
| *Marking* | What proportion of lambs also mulesed? | 233 | 263 |
| | Done by: 1. farm labour 2. contract? | 234 | 264 |
| *Mulesing* | What proportion of weaners? | 235 | 265 |
| | What proportion of ewes? | 236 | 266 |
| *Shearing* | 1. lambs 2. adults or 3. both? | 237 | 267 |
| *Dipping* | 0. (no), or 1. (yes). | 238 | 268 |
| *Crutching* | 0. (no), or 1. (yes). | 239 | 269 |
| *Jetting* | 0. (no), or 1. (yes). | 240 | 270 |
| *Drenching* | For: 1. fluke 2. worms 3. both? | 241 | 271 |
| | Lambs: 0. (no), or 1. (yes). | 242 | 272 |
| | Weaners: 0. (no), or 1. (yes). | 243 | 273 |
| | Adults: 0. (no), or 1. (yes), | 244 | 274 |
| *Vaccinating* | Lambs: 0. (no), or 1. (yes). | 245 | 275 |
| | In-lamb ewes: 0. (no), or 1. (yes). | 246 | 276 |

## DECISIONS FOR CATTLE ENTERPRISE

| | | | |
|---|---|---|---|
| *Purchases (Store Stock)* | Timing of the purchase:<br>1. early or 2. late in the month? | 280 | 2 |
| | No. of weaners | 281 | |
| | No. of heifer yearlings | 282 | 20 |
| | No. of steer yearlings | 283 | 20 |
| | No. of cows | 284 | |
| | No. of bulls | 285 | |
| *Sales (Fat Stock)* | Timing of the sales:<br>1. early or 2. late in the month? | 286 | |
| | No. of calves | 287 | |
| | No. of vealers | 288 | |
| | No. of heifers | 289 | |
| | No. of steers | 290 | |
| | No. of cows | 291 | |
| | No. of bulls | 292 | |
| *Mating* | 0. (no), 1. (yes). | 293 | |
| *Marking* | 0. (no), 1. (yes). | 294 | |
| *Drenching* | 0. (no), 1. (yes). | 295 | |
| *Lice Control* | 0. (no), 1. (yes). | 296 | |

## DECISIONS FOR FENCING PROJECTS

| *Fencing project number* | | ONE | TWO | THREE |
|---|---|---|---|---|
| *Length* | No. of chains involved? | 300 45 | 305 45 | 310 |
| *Labour* | Will be: 1. farm labour<br>2. contract? | 301 1 | 306 1 | 311 |
| *Updating Improved Pasture Numbers* | If a sown pasture is to be subdivided, its number is? | 302 1 | 307 2 | 312 |
| | After subdivision, the number of acres given this pasture number will be? | 303 67 | 308 66 | 313 |
| | The rest of the pasture will then be known as pasture number? | 304 2 | 309 3 | 314 |

## DECISIONS FOR CULTIVATIONS

| *Cultivation number* | | ONE | TWO | THREE |
|---|---|---|---|---|
| *Area* | This paddock has an acreage of? | 320 | 325 | 330 |
| *Cropping History* | Prior to being cultivated this paddock was: 1. bare fallow 2. native pasture 3. freshly cleared 4. sown pasture 5. oat stubble 6. wheat stubble 7. potato trash? | 321 | 326 | 331 |
| | The paddock was crop or pasture number?<br>(If it was bare fallow, native pasture or freshly cleared answer "0"). | 322 | 327 | 332 |
| *Cropping Intentions* | This cultivation is for: 1. oats 2. pasture (including lucerne) 3. wheat 4 potatoes? | 323 | 328 | 333 |
| *Timing* | Cultivating: 1. early or 2. late in the month? | 324 | 329 | 334 |

## MAINTENANCE AND DEVELOPMENT DECISIONS

| | | |
|---|---|---|
| *Maintenance* | Man-days on machinery maintenance? | 340 |
| | Man-days on structural maintenance? | 341 |
| *Clearing* | No. of acres? | 342 200 |
| | Done by: 1. farm labour<br>2. contract? | 343 2 |
| *Stockyards* | Erecting sheep-yards: 0. (no), 1. (yes). | 344 |
| | Erecting cattle-yards: 0. (no), 1. (yes). | 345 |
| *Topdressing Native Pasture* | No. of acres? | 346 |
| | Superphosphate per acre:<br>1. 0.5 cwt. 2. 1 cwt.<br>3. 1.5 cwt. 4. 2 cwt.? | 347 |
| | Done by: 1. farm labour<br>2. contract? | 348 |

## FODDER PURCHASES AND SALES DECISIONS

| | | |
|---|---|---|
| *Purchases* | No. of tons of lucerne hay? | 350 |
| | No. of tons of oaten hay? | 351 |
| | No. of bushels of oats? | 352 |
| | No. of bushels of wheat? | 353 |
| *Sales* | No. of tons of lucerne hay? | 354 |
| | No. of tons of pasture hay? | 355 |
| | No. of tons of oaten hay? | 356 |
| | No. of bushels of oats? | 357 |

## BORROWING AND CAPITAL PURCHASES DECISIONS

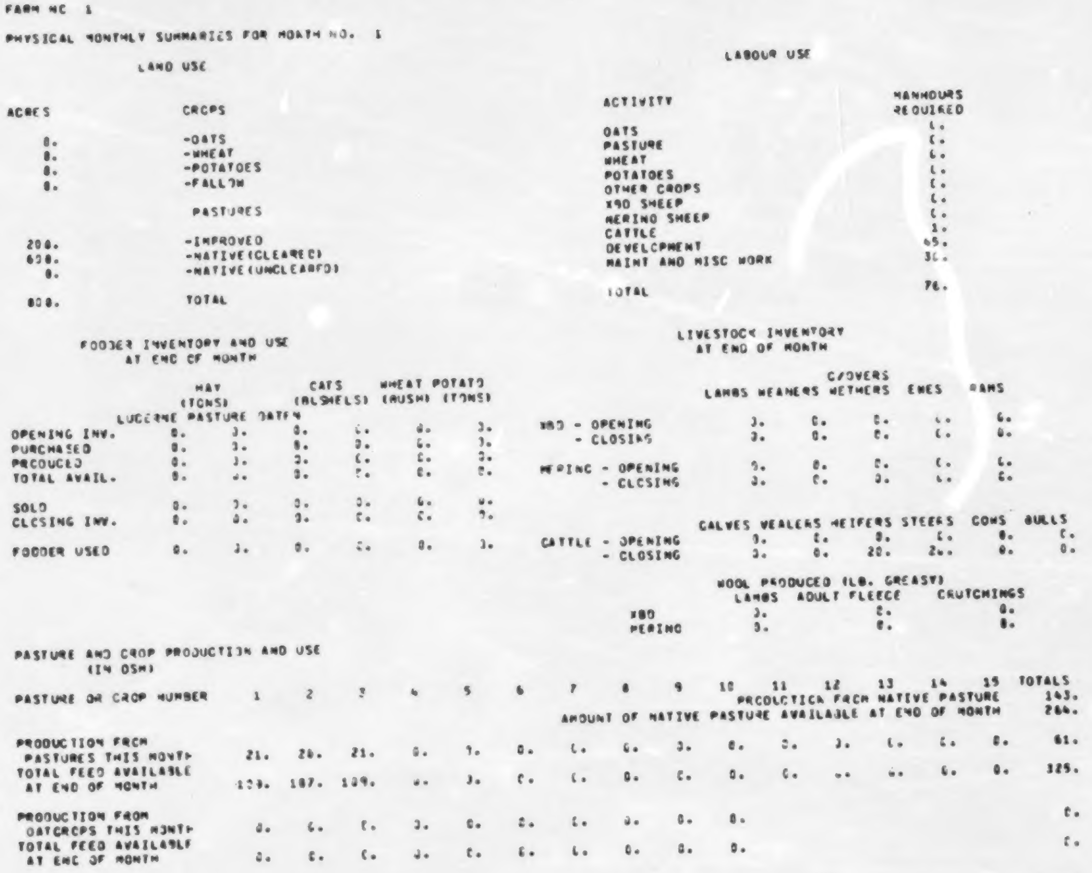
| | | |
|---|---|---|
| *Borrowing* | Amount (in dollars) | 360<br>10000 |
| | Funds raised are to be used for:<br>1. land 2. machinery, plant, buildings<br>3. development? | 361<br>3 |
| *Tillage Machinery* | No. of tractors (55-60 H.P.) | 362 |
| | No. of mouldboard ploughs | 363 |
| | No. of light chisel ploughs/cultivators/scarifiers | 364 |
| | No. of disc ploughs | 365 |
| | No. of disc harrows (tandem discs) | 366 |
| | No. of sets of diamond harrows | 367 |
| | No. of sets of inter-row tillage and hilling equipment for potatoes | 368 |
| *Cropping Machinery* | No. of combines (seeders) | 369 |
| | No. of 2-row potato planters | 370 |
| | No. of PTO grain harvesters | 371 |
| | No. of mower-hay rake units | 372 |
| | No. of superspreaders | 373 |
| | No. of PTO balers | 374 |
| | No. of 2-row potato diggers | 375 |
| | No. of tractor mounted boom sprays with PTO pumps | 376 |
| | No. of rotary trash and weed slashers | 377 |
| *Other Plant* | No. of Holden utilities | 378 |
| | No. of 2-ton trucks | 379 |
| | No. of landrovers | 380 |
| | No. of 1½-ton trailers | 381 |
| *Farm Structures* | No. of 5000 bale capacity haysheds | 382 |
| | No. of 1200 bushel capacity silos | 383 |
| | No. of (40 feet × 20 feet) storage sheds | 384 |
| *Additional Land* | 1. block A 2. block B 3. both blocks. | 385 |

## BORROWING AND CAPITAL PURCHASES DECISIONS

| | | |
|---|---|---|
| *Borrowing* | Amount (in dollars) | 360<br>10000 |
| | Funds raised are to be used for:<br>1. land 2. machinery, plant, buildings<br>3. development? | 361<br>3 |
| *Tillage Machinery* | No. of tractors (55-60 H.P.) | 362 |
| | No. of mouldboard ploughs | 363 |
| | No. of light chisel ploughs/cultivators/scarifiers | 364 |
| | No. of disc ploughs | 365 |
| | No. of disc harrows (tandem discs) | 366 |
| | No. of sets of diamond harrows | 367 |
| | No. of sets of inter-row tillage and hilling equipment for potatoes | 368 |
| *Cropping Machinery* | No. of combines (seeders) | 369 |
| | No. of 2-row potato planters | 370 |
| | No. of PTO grain harvesters | 371 |
| | No. of mower-hay rake units | 372 |
| | No. of superspreaders | 373 |
| | No. of PTO balers | 374 |
| | No. of 2-row potato diggers | 375 |
| | No. of tractor mounted boom sprays with PTO pumps | 376 |
| | No. of rotary trash and weed slashers | 377 |
| *Other Plant* | No. of Holden utilities | 378 |
| | No. of 2-ton trucks | 379 |
| | No. of landrovers | 380 |
| | No. of 1½-ton trailers | 381 |
| *Farm Structures* | No. of 5000 bale capacity haysheds | 382 |
| | No. of 1200 bushel capacity silos | 383 |
| | No. of (40 feet × 20 feet) storage sheds | 384 |
| *Additional Land* | 1. block A 2. block B 3. both blocks. | 385 |

# APPENDIX A-2

Sample Computer Output from the Original Version of the CTFMG.



```
FARM NC  1

PHYSICAL MONTHLY SUMMARIES FOR MONTH NO.  1
                                                                          LABOUR USE
            LAND USE

                                                              ACTIVITY                      MANHOURS
ACRES              CROPS                                                                    REQUIRED
                                                              OATS                             0.
   0.              -OATS                                      PASTURE                          0.
   0.              -WHEAT                                     WHEAT                            0.
   0.              -POTATOES                                  POTATOES                         0.
   0.              -FALLOW                                    OTHER CROPS                      0.
                                                              X90 SHEEP                        0.
                    PASTURES                                  MERINO SHEEP                     0.
                                                              CATTLE                           1.
 200.              -IMPROVED                                  DEVELOPMENT                     65.
 600.              -NATIVE(CLEARED)                           MAINT AND MISC WORK             10.
   0.              -NATIVE(UNCLEARED)
                                                              TOTAL                           76.
 800.              TOTAL

                                                                   LIVESTOCK INVENTORY
      FODDER INVENTORY AND USE                                      AT END OF MONTH
         AT END OF MONTH
                                                                               C/OVERS
                   HAY              OATS    WHEAT POTATO              LAMBS WEANERS WETHERS  EWES   RAMS
                  (TONS)         (BUSHELS) (BUSH) (TONS)
          LUCERNE PASTURE OATEN                                 X90 - OPENING        0.      0.     0.     0.     0.
OPENING INV.    0.     0.     0.     0.     0.     0.              - CLOSING        0.      0.     0.     0.     0.
PURCHASED       0.     0.     0.     0.     0.     0.
PRODUCED        0.     0.     0.     0.     0.     0.      MERINO - OPENING        0.      0.     0.     0.     0.
TOTAL AVAIL.    0.     0.     0.     0.     0.     0.              - CLOSING        0.      0.     0.     0.     0.

SOLD            0.     0.     0.     0.     0.     0.
CLOSING INV.    0.     0.     0.     0.     0.     0.              CALVES VEALERS HEIFERS STEERS  COWS  BULLS
                                                      CATTLE - OPENING       0.     0.      0.     0.     0.     0.
FODDER USED     0.     0.     0.     0.     0.     0.          - CLOSING       0.     0.     20.    24.     0.     0.

                                                                    WOOL PRODUCED (LB. GREASY)
                                                                     LAMBS  ADULT FLEECE    CRUTCHINGS
                                                             X90      0.           0.           0.
                                                             MERINO   0.           0.           0.

PASTURE AND CROP PRODUCTION AND USE
        (IN DSM)
                                                                                                              TOTALS
PASTURE OR CROP NUMBER    1     2     3     4     5     6     7     8     9    10    11    12    13    14    15
                                                                     PRODUCTION FROM NATIVE PASTURE     143.
                                                     AMOUNT OF NATIVE PASTURE AVAILABLE AT END OF MONTH     264.

PRODUCTION FROM
 PASTURES THIS MONTH     21.   26.   21.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    61.
TOTAL FEED AVAILABLE
 AT END OF MONTH        129.  107.  109.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.   325.

PRODUCTION FROM
 OATCROPS THIS MONTH      0.    0.    0.    0.    0.    0.    0.    0.    0.    0.                                  0.
TOTAL FEED AVAILABLE
 AT END OF MONTH          0.    0.    0.    0.    0.    0.    0.    0.    0.    0.                                  0.
```

COPY AVAILABLE

```
FARM NO  1

CASH RECEIPTS AND CASH PAYMENTS FOR MONTH NO  1

                    OATS    PAST   WHEAT  POTATO LP/HAY    XBD MERINO CATTLE   MAINT   UNALL    TOTAL
RECEIPTS
   SALE OF
   PRODUCE            0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.

PAYMENTS
   REPAIRS            0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   FUEL/OIL           0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   ELECT              0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   DIPS,ETC           0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   FODDER             0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   SEEDS              0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   FERTILISER         0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   SPRAYS,ETC         0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   CONTRACT           0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   CAS. WAGES         0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   ADMIN.             0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   INSURANCE          0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   RENT R/T           0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   WAGES              0.      0.      0.      0.      0.     0.     0.     0.      0.    250.     250.
   INC. TAX           0.      0.      0.      0.      0.     0.     0.     0.      0.      0.       0.
   L ST PUR           0.      0.      0.      0.      0.     0.     0.  6142.      0.      0.    6142.

CAPITAL EXP
   STRUCTURES                                                                                     0.
   FENCES/YDS                                                                                   567.
   WATER                                                                                        276.
   CLEARING                                                                                    6000.
   TRACTORS                                                                                       0.
   MACHINES                                                                                       0.
   PLANT                                                                                          0.
   LAND                                                                                           0.

                                                     TOTAL PAYMENTS                           13235.

                                          FUNDS BORROWED THIS MONTH                           10000.

                                          END OF MONTH BANK BALANCE                            6765.


                 NOTES- 1. THIS TABLE DOES NOT INCLUDE THE PAYMENT OF INTEREST ON LOANS
                           OR FOR REPAYMENT OF PRINCIPAL, ALL SUCH PAYMENTS ARE MADE AT
                           THE END OF EACH YEAR.
                        2. INTEREST ON OVERDRAFT IS CALCULATED ON MONTHEND BALANCES BUT
                           PAYMENT IS MADE ANNUALLY, AT THE END OF EACH YEAR.
                        3. SHIRE RATES AND MISCELLANEOUS ADMINISTRATIVE COSTS ARE PAID
                           IN DECEMBER EACH YEAR.
STARTING DATA
TAX DATA
```

## APPENDIX A-3

## CODING SHEET

NAME TEST DATA PAGE 1

DATE

| Box | Value | Box | Value | Box | Value |
|---|---|---|---|---|---|
| 875 | 1976 | 280 | 2 | | |
| 1976 | 1 | 282 | 20 | | |
| 1 | 1 | 283 | 20 | | |
| // | | 360 | 10000 | | |
| /^/ | | 361 | 3 | | |
| // | | // | | | |
| 1 | 1 | 12345 | | | |
| 10 | 1 | // | | | |
| 11 | 1976 | | | | |
| 12 | 1 | | | | |
| 342 | 200 | | | | |
| 343 | 2 | | | | |
| 300 | 45 | | | | |
| 301 | 1 | | | | |
| // | | | | | |
| 1 | 1 | | | | |
| 302 | 1 | | | | |
| 303 | 67 | | | | |
| 304 | 2 | | | | |
| 305 | 45 | | | | |
| 306 | 1 | | | | |
| 307 | 2 | | | | |
| 308 | 66 | | | | |
| // | | | | | |
| 1 | 1 | | | | |
| 309 | 3 | | | | |

## APPENDIX A-4

### Sample Computer Output from the Modified Version (Interactive Version) of the CTFMG.

```
JANUARY, 1976.
RAINFALL REGISTRATION.
     ADEQUATE FOR PLANT GROWTH.
     (375. POINTS)
MARKET REPORT???
MARKET REPORT
LIVESTOCK PRICES (PER HEAD)  STORE STOCK MARKET FAT STOCK MARKET
SHEEP-                            XBD      MERINO      XBD    MERINO
  LAMBS                         10.00        9.36    12.76     11.95
  WEANERS                        9.62        9.83    11.71     10.88
  CARRYOVERS OR WETHERS          6.79        7.28     7.95      7.94
  EWES                          11.50       12.56     8.47      9.66
  RAMS                          50.00       60.00     4.20      4.36
CATTLE-
  CALVES                             80.31           96.32
  VEALERS                           113.79          134.16
  HEIFERS                           168.52          149.86
  STEERS                            132.58          160.26
  COWS                              201.38          175.60
  BULLS                             400.00          188.50

FODDER PRICES (DOLLARS/UNIT)
LUCERNE HAY (PER TON)        24.
PASTURE HAY (PER TON)        19.
OATEN HAY (PER TON)          54.
OATS (PER BUSHEL)              .96
WHEAT (PER BUSHEL)            1.40

POTATOES (PER TON)           91.

WOOL PRICES      XBD MERINO
(PER POUND CLEAN)

FLEECE WOOL             .83   .99
CRUTCHINGS              .50   .55
FARM DATA
..
..
..
..
```

## APPENDIX A-4 (Contd.)

```
FARM NO. 1
PHYSICAL SUMMARIES FOR MONTH NO. 1
ENTER 1 OR 0 FOR OUTPUTS (X7)
    LAND USE
ACRES      CROPS
  0.       - OATS
  0.       - WHEAT
  0.       - POTATOES
  0.       - FALLOW
           PASTURES
200.       - IMPROVED
600.       - NATIVE (CLEARED)
  0.       - NATIVE (UNCLEARED)

800.       - TOTAL

   LABOUR USE
ACTIVITY                MANHOURS
OATS                      0.
PASTURE                   0.
WHEAT                     0.
POTATOES                  0.
OTHER CROPS               0.
XBD SHEEP                 0.
MERINO SHEEP              0.
CATTLE                    0.
DEVELOPMENT              45.
MAINT AND MISC WORK      30.

TOTAL                    76.

FODDER INVENTORY AND USE
                   HAY                  OATS     WHEAT   POTATO
                  (TONS)             (BUSHELS)  (BUSH)   (TONS)
        LUCERNE PASTURE OATEN
OPENING INV.  0.     0.     0.          0.        0.       0.
PURCHASED     0.     0.     0.          0.        0.       0.
PRODUCED      0.     0.     0.          0.        0.       0.
TOTAL AVAIL.  0.     0.     0.          0.        0.       0.

SOLD          0.     0.     0.          0.        0.       0.
```

APPENDIX A-4 (Contd.)

| | HAY (TONS) | | | OATS (BUSHELS) | WHEAT (BUSH) | POTATO (TONS) |
|---|---|---|---|---|---|---|
| | LUCERNE | PASTURE | OATEN | | | |
| CLOSING INV. | 0. | 0. | 0. | 0. | 0. | 0. |
| FODDER USED | 0. | 0. | 0. | 0. | 0. | 0. |

LIVESTOCK INVENTORY

| | LAMBS | WEANERS | C/OVERS WETHERS | EWES | RAMS |
|---|---|---|---|---|---|
| XBD - OPENING | 0. | 0. | 0. | 0. | 0. |
| - CLOSING | 0. | 0. | 0. | 0. | 0. |
| MERINO - OPENING | 0. | 0. | 0. | 0. | 0. |
| - CLOSING | 0. | 0. | 0. | 0. | 0. |

| | CALVES | VEALERS | HEIFERS | STEERS | COWS | BULLS |
|---|---|---|---|---|---|---|
| CATTLE - OPENING | 0. | 0. | 0. | 0. | 0. | 0. |
| - CLOSING | 0. | 0. | 20. | 20. | 0. | 0. |

WOOL PRODUCED (LB. GREASY)

| | LAMBS | ADULT FLEECE | CRUTCHINGS |
|---|---|---|---|
| XBD | 0. | 0. | 0. |
| MERINO | 0. | 0. | 0. |

| PASTURE AND CROP PRODUCTION AND USE (DSM) | TOTALS |
|---|---|
| PRODUCTION NATIVE PASTURE | 143. |
| TOTAL AVAILABLE END OF MONTH | 264. |
| PRODUCTION PASTURES | 61. |
| TOTAL AVAILABLE END OF MONTH | 325. |
| PRODUCTION OATCROPS | 0. |
| TOTAL AVAILABLE END OF MONTH | 0. |

CASH RECEIPTS AND PAYMENTS FOR MONTH NO. 1

| | TOTALS |
|---|---|
| RECEIPTS | |
| SALE OF PRODUCE | 0. |

## APPENDIX A-4 (Contd.)

PAYMENTS

| | |
|---|---|
| REPAIRS | 0. |
| FUEL/OIL | 0. |
| ELECT | 0. |
| DIPS ETC. | 0. |
| FODDER | 0. |
| SEEDS | 0. |
| FERTILISER | 0. |
| SPRAYS ETC | 0. |
| CONTRACT | 0. |
| CAS. WAGES | 0. |
| ADMIN. | 0. |
| INSURANCE | 0. |
| RENT R/T | 0. |
| WAGES | 250. |
| INCOME TAX | 0. |
| L ST PUR | 6142. |

CAPITAL EXP.

| | |
|---|---|
| STRUCTURES | 0. |
| FENCES/YDS | 567. |
| WATER | 276. |
| CLEARING | 6000. |
| TRACTORS | 0. |
| MACHINES | 0. |
| PLANT | 0. |
| LAND | 0. |

| | |
|---|---|
| TOTAL PAYMENTS | 13235. |
| FUNDS BORROWED THIS MONTH | 10000. |
| END OF MONTH BANK BALANCE | 6765. |

## APPENDIX B-1

### List, in Frequency of Occurrence, of Elements Used in Round One Grids

(List was presented to farmers, and additional elements were added by farmers)

| ELEMENTS | NUMBER OF TIMES CHOSEN |
|---|---|
| Self | 12 |
| Animal Husbandry | 12 |
| Marketing | 11 |
| Climate/Seasons | 11 |
| Record Keeping/Book Keeping | 9 |
| Planning | 8 |
| Budgeting | 7 |
| Pasture Establishment | 7 |
| Economics/Finance | 7 |
| Risk Taking | 7 |
| Machinery Maintenance | 7 |
| Soil/Soil Management | 6 |
| Animal Health | 6 |
| Pasture Management | 6 |
| Mechanical Knowledge | 5 |
| Love of Work | 5 |
| Tools | 4 |
| Plant Nutrition | 4 |
| Crop Management | 4 |
| Decision Making | 4 |
| Borrowing Finance | 3 |
| Time | 3 |
| Practical Experience | 3 |
| Production Economics | 2 |
| Animal Nutrition | 2 |
| Animal Behaviour | 2 |
| Animal Breeding | 2 |
| Banking | 2 |
| Common Sense | 2 |
| Sideline Enterprises | 2 |
| Net Farm Income | 2 |

APPENDIX B-1 (Contd.)

| ELEMENTS | NUMBER OF TIMES CHOSEN |
|---|---|
| Environment | 1 |
| Pasture Utilisation | 1 |
| Crop Establishment | 1 |
| Crop Utilisation | 1 |
| Stocking Rate | 1 |
| Topography | 1 |
| Abstract Reasoning | 1 |
| Tidiness | 1 |
| Income Generation | 1 |
| Profitability | 1 |
| Financial Risk | 1 |
| Knowledge of Sheep | 1 |
| Knowledge of Cattle | 1 |
| Use of Machinery | 1 |
| Fencing | 1 |
| Wool Texture | 1 |
| Fodder Conservation | 1 |

# APPENDIX B-1

## Additional Elements Elicited from Farmers in 11 Subsequent Grids*

| ELEMENT | NUMBER OF TIMES MENTIONED |
|---|---|
| Self | 11 |
| Wife | 11 |
| Father | 8 |
| Mother | 8 |
| Neighbour | 7 |
| Good Farmer | 6 |
| Bad Farmer | 5 |
| Advisory Services | 5 |
| Best Friend | 4 |
| Brother | 4 |
| Bank Manager | 4 |
| Stock Agent | 3 |
| Peer Farmer | 3 |
| Partner | 3 |
| Threatening Person | 3 |
| Sons | 3 |
| Farmer Groups | 2 |
| Marketing | 2 |
| Successful Person | 2 |
| Ethical Person | 2 |
| Uncle | 2 |
| Sister | 2 |
| Labour | 2 |
| Ideal Self | 2 |
| Female Friend | 2 |
| Planning | 2 |
| Rejecting Person | 1 |
| Unlucky Person | 1 |
| Successful Businessman | 1 |

APPENDIX B-1 (Contd.)

| ELEMENTS |
|---|
| **ELEMENTS PRESENTED BUT NOT USED** |
| Consultants |
| Plant Growth |
| Plant Development |
| Inventory |
| Marketing Risk |
| Family |
| Intelligence |
| Mechanical Reasoning |
| Analytical Ability |

| ELEMENT | NUMBER OF TIMES MENTIONED |
|---|---|
| Politician | 1 |
| Cousin | 1 |
| Teacher | 1 |
| Decision Making | 1 |
| Consultant | 1 |
| Male Friend | 1 |
| Ex-friend | 1 |
| Happy Person | 1 |
| Demanding Person | 1 |
| Rejecting Person | 1 |
| Pitied Person | 1 |

* In many instances the subjects used names of people. The elements used above described the selected persons, to ensure anonymity.

## APPENDIX B-2

## Sample Computer Output Plot from the Modified INGRID 72 Program INGPLT

```
***   SUBJECT -BETA- RUN THREE


PLOT OF DIMENSION 1(VERT) BY DIMENSION 2(HOR)
------------------------------------------------------------------------
I                  20     3                                            I
I          56                 2                                        I
I          46                      50                                  I
I                   1            12                                    I
I            14                     9  47                              I
I          53                               4                          I
I                          16                                          I
I13                                                                    I
I                                                    41                I
I                                                                      I
I                                                                      I
I      49                                                              I
I                                                                      I
I                                                                      I
I                                                                      I
I                                                                     6I
I                                                                      I
I                                                                      I
I                                                                      I
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I                                                                      I
I                                                                      I
I                                                           5          I
I                                                                      I
I                                                                      I
I                                                                      I
I                                                                      I
I                                                                      I
I                                                                      I
I   11    15                                                  52       I
I                                                   42                 I
I                                                                      I
I                                                                      I
I                                 55                                   I
I                           18                                         I
I                         7     17  44                                 I
I                                                                      I
I                                                                      I
I                                                                      I
I       54                                                             I
I       43                                                             I
------------------------------------------------------------------------
```
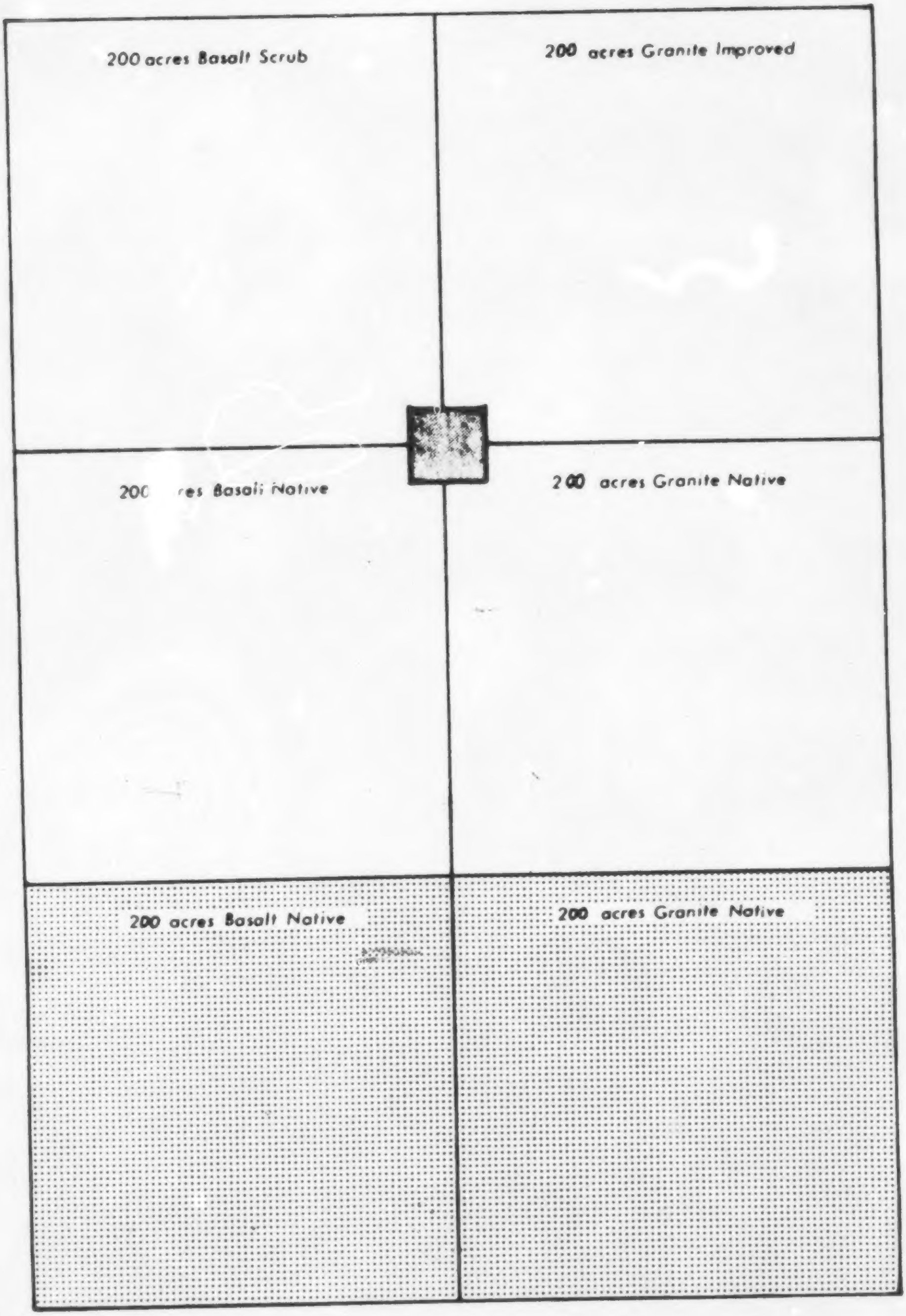

# APPENDIX C-1

NAME ____________________ YEAR ___

DATE ________


200 acres Basalt Scrub
200 acres Granite Improved
200 acres Basalt Native
200 acres Granite Native
200 acres Basalt Native
200 acres Granite Native

# APPENDIX C-2

## CODING SHEET

NAME ---------------------------- PAGE -----

DATE ----------------------------

| Box | Value | Box | Value | Box | Value |
|---|---|---|---|---|---|
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## APPENDIX C-3

Sample 16x20 Blank REP Test Grid.

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ( ) | | | | | ( ) | | ( ) | | | | ( ) | | | | | | |
| | | | ( ) | ( ) | | | | | ( ) | | ( ) | | | | | | | | |
| | | | | | | ( ) | | | | | ( ) | | | ( ) | | | | | |
| | | | | | | | | | | | | ( ) | | | | | ( ) | | ( ) |
| | | | | ( ) | ( ) | | | | | | | ( ) | | | | | ( ) | | |
| | | | ( ) | | | | | | | | | | | ( ) | | ( ) | | ( ) | |
| | ( ) | ( ) | | | | | | | | | | | | | | | ( ) | | |
| | | | | | | | | | | ( ) | | ( ) | ( ) | | | | | | |
| | | | | | | | ( ) | ( ) | ( ) | | | | | | ( ) | | | | |
| ( ) | | | | | | | | | | ( ) | ( ) | | | | ( ) | | | | |
| | | | ( ) | | | ( ) | | | | | | | ( ) | | | | | | ( ) |
| | | | | | | | | | | | | | | ( ) | | ( ) | | ( ) | ( ) |
| | ( ) | | | | ( ) | | | ( ) | | | | | | | | ( ) | | | |
| | | ( ) | | | | ( ) | | ( ) | | ( ) | | | | | | | | | |
| ( ) | ( ) | | | ( ) | | | ( ) | | | | | | | | | | | | |
| ( ) | | | | | ( ) | | | | | | | | | | ( ) | | | ( ) | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 0 |

## APPENDIX C-4

### REP Test Construct Record Sheet.

WAY DIFFERENT

WAY ALIKE

## APPENDIX D-1

## Elements and Constructs
## For Subject Mu

Grid No. 1 2/12/1975

| ELEMENTS | | ELEMENTS | |
|---|---|---|---|
| Self | (41) | Seasonal Records/ Climate | (49) |
| Plant | (42) | | |
| Record Keeping | (43) | Machinery | (50) |
| Breeding | (44) | Disease Prevention | (51) |
| Marketing | (45) | Wool Texture | (52) |
| Pastures | (46) | Weed Control | (53) |
| Animal Husbandry | (47) | Budgeting | (54) |
| Love of Work | (48) | Book-Keeping | (55) |

CONSTRUCTS

WAY ALIKE

1. Necessary parts of good farming
2. Necessary parts of good farming
3. Very important to have finance up to date
4. Good grass and healthy stock are a must
5. These two aspects go hand in hand
6. Wool texture is the result of breeding
7. Is just good business
8. If pastures are properly nourished, weeds disappear
9. Good records make breeding easy
10. These go hand in hand
11. These go hand in hand
12. Makes for a better income, easily recorded
13. A seasonal record helps to keep work down
14. Seasonal records help with correct management
15. Financial aspect of management
16. Most important for smooth running of farm
17. Major ingredients in a successful business
18. Machinery very helpful in weed control
19. Marketing is my one unsolved problem
20. Good pastures suppress weeds

## APPENDIX D-2

## Elements and Constructs

## For Subject Mu

Grid No. 2 3/12/1975

| ELEMENTS | | ELEMENTS | |
|---|---|---|---|
| Self | (41) | Bank Manager | (49) |
| Wife | (42) | Shearer | (50) |
| Father | (43) | Labour | (51) |
| Mother | (44) | Neighbour | (52) |
| Brother | (45) | Good Farmer | (53) |
| Brother | (46) | Bad Farmer | (54) |
| Son | (47) | Sportsman | (55) |
| Son | (48) | | |

CONSTRUCTS

| | WAY ALIKE | WAY DIFFERENT |
|---|---|---|
| 1. | Good family influence | My responsibility |
| 2. | These people are main driving force | To my advantage |
| 3. | Tested my patience to limit | One of life's experiences |
| 4. | A recreation highlight | To my personal benefit |
| 5. | Assisted in smooth running of farm | Considerable financial help |
| 6. | My best friend | Helped in times of adversity |
| 7. | I was the go between | Satisfactory result |
| 8. | A happy association | Made for placid home life |
| 9. | God fearing people | Morally advantageous |
| 10. | Not outstanding | Not sportsman |
| 11. | Made farming possible for me | Most satisfactory |
| 12. | A trier | Moderate result |
| 13. | Most important for success | A happy association |

APPENDIX D-2 (Contd.)

| CONSTRUCTS | |
|---|---|
| WAY ALIKE | WAY DIFFERENT |
| 14. Received great encouragement | Most necessary |
| 15. Financially very bad | Made for strained relation |
| 16. A happy association | Helped both, I hope |
| 17. Worked against me | Made for strained relations |
| 18. Very important combination | Result excellent |
| 19. Resented his seniority | A great pity |
| 20. A happy relation | To our mutual benefit |

## APPENDIX D-3

### Elements and Constructs
### For Subject Gamma

Grid No. 1 5/11/1975

| ELEMENTS | | ELEMENTS | |
|---|---|---|---|
| Self | (41) | Pastures | (49) |
| Animal Nutrition | (42) | Record Keeping | (50) |
| Marketing | (43) | Decision Making | (51) |
| Climate | (44) | Soils | (52) |
| Budgeting | (45) | Crops | (53) |
| Animal Husbandry | (46) | Practical Experience | (54) |
| Disease | (47) | Plant Nutrition | (55) |
| Finance | (48) | Mechanical Knowledge | (56) |

CONSTRUCTS

| | WAY ALIKE | WAY DIFFERENT |
|---|---|---|
| 1. | Positive aspects of management | Negative aspects of management |
| 2. | Part of the same cycle | Different issue |
| 3. | Intelligence - thought issues | Instinctive |
| 4. | Basically concrete and finite | Less direct profit |
| 5. | Basic to farm | Variable |
| 6. | Linked farming skill | New area of concern separate |
| 7. | Either = main love of farming | Usually necessary but not loved |
| 8. | A degree of predicability | Unknown |
| 9. | Practical | Theory |
| 10. | Primary variable | Final variable |
| 11. | Skill | Not a skill |
| 12. | Ends | Means |
| 13. | Skills | Not skill |

APPENDIX D-3 (Contd.)

| CONSTRUCTS | |
|---|---|
| WAY ALIKE | WAY DIFFERENT |
| 14. Closely linked and fundamental | Adhered |
| 15. Organic | Not organic |
| 16. Management skills | Not management skill |
| 17. Same general area of concern | Different area of concern |
| 18. Positive skills | Not skill |
| 19. Important linkage | Less important linkage |

APPENDIX D-4

## Elements and Constructs
## For Subject Gamma

Grid No. 2 19/2/1976

| ELEMENTS | | ELEMENTS | |
|---|---|---|---|
| Self | (41) | Local Opinion Leader | (49) |
| Father | (42) | Local Tradition | (50) |
| Mother | (43) | Good Farmer | (51) |
| Wife | (44) | Bad Farmer | (52) |
| Brother | (45) | Rural Research | (53) |
| Neighbour | (46) | Bank Manager | (54) |
| Department of Agriculture | (47) | Non-farmer Friend | (55) |
| Stock Agent | (48) | Friend | (56) |

CONSTRUCTS

| | WAY ALIKE | WAY DIFFERENT |
|---|---|---|
| 1. | Influence on decision making | - |
| 2. | Similar approach | - |
| 3. | Stereotype to escape from | - |
| 4. | Fascilitate attitude change | - |
| 5. | Featured in farm part of total experience not end in itself | - |
| 6. | Helped get out of stereotype | - |
| 7. | Talkers | Practical person |
| 8. | Financial part end in itself | - |
| 9. | Traditional view of farming | - |
| 10. | Threaten me (farming wise) | - |
| 11. | Sources of new stimuli | - |
| 12. | Assertive | - |
| 13. | Uncreative status quo | - |
| 14. | Hard nosed operators | - |
| 15. | Respected practitioners | - |

APPENDIX D-4 (Contd.)

| CONSTRUCTS | | |
|---|---|---|
| | WAY ALIKE | WAY DIFFERENT |
| 16. | Perceive themselves as having input | - |
| 17. | Attempted scientific approach | - |
| 18. | Lots of ideas - little practical experience | - |
| 19. | Reinforced tradition | - |
| 20. | Present image of having it all together | - |
| 21. | Hard-nosed approach | - |

## APPENDIX D-5

## Elements and Constructs
## For Subject Gamma

Grid No. 3 19/2/1976

| ELEMENTS | | ELEMENTS | |
|---|---|---|---|
| Self | (41) | Threatening Person | (49) |
| Wife | (42) | "Sun Club" | (50) |
| Father | (43) | Person Whom/Threatened | (51) |
| Neighbour | (44) | Person/Dislikes | (52) |
| Mother | (45) | Person/Respects | (53) |
| Neighbour's Wife | (46) | Conventional Farmer | (54) |
| Female Friend | (47) | Teacher's Wife | (55) |
| Female Friend's Husband | (48) | Pitied Person | (56) |

CONSTRUCTS

| | WAY ALIKE | WAY DIFFERENT |
|---|---|---|
| 1. | Vast common experience | - |
| 2. | Loners | - |
| 3. | Physically tight | Physically free |
| 4. | Starting to explore relationship | - |
| 5. | Growing nodes - loving | Reacting hateful |
| 6. | Exciting stimulated | - |
| 7. | Sense basic sexuality | - |
| 8. | Sexuality affects me | - |
| 9. | Live in here-now | - |
| 10. | Sexuality threatens me | - |
| 11. | Reinforce guilt | - |
| 12. | Feel sexual tension with real people | - |
| 13. | Tend to be less open | - |
| 14. | Tend to lack 'flair', 'zap', 'spunk' | - |

APPENDIX D-5 (Contd.)

| CONSTRUCTS | |
|---|---|
| WAY ALIKE | WAY DIFFERENT |
| 15. Sensitive and caring | - |
| 16. Non-risk takers | - |
| 17. Screwed-in physically | - |
| 18. Yes, but | - |
| 19. Small influence on opinions | - |